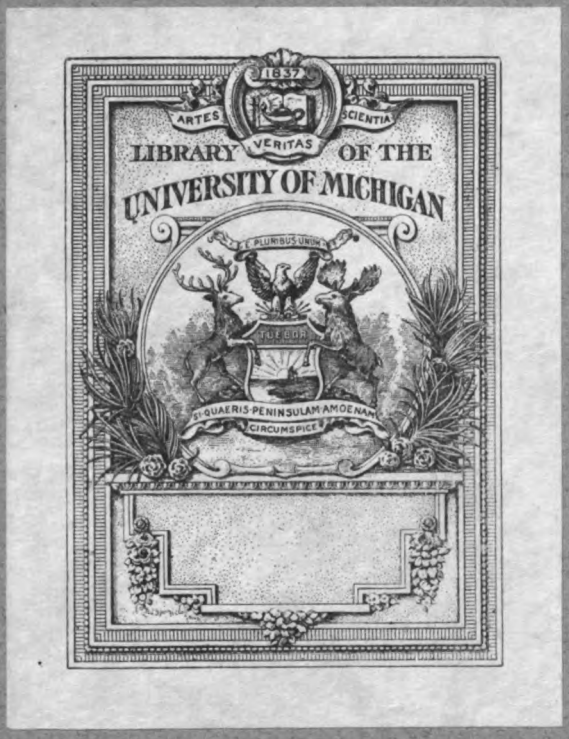
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* *Note to the Binder.*—These are to be bound to follow all the numbers of THE JOURNAL OF TROPICAL MEDICINE.

Original Communication.

SOME EXPERIMENTAL FACTS *RE* KALA-AZAR (INDIAN).*

SECOND MEMOIR.

By R. Row, M.D.Lond., D.Sc.Lond.

SINCE writing [1] on the subject of localized lesions induced subcutaneously with kala-azar cultures in *Macacus sinicus* I have a few more data, and these are summarized here.

The monkey which, it may be remembered, developed after an incubation period of five months two bean-like subcutaneous nodules at the seat of infection with a three-weeks-old culture of kala-azar in N.N.N. medium continued thriving, and was none the worse for the lesions, and is even now (ten months after the infection) in a very good condition. The nodules, however, increased gradually in size, always remaining firm and movable under the skin, which remained throughout healthy. Of the two nodules, the one on the right side was excised on July 17, 1912, *i.e.*, a fortnight after its appearance, and one half of it was hardened and cut into sections, while the other half was crushed in about 1 c.c. of NaCl (0.6 per cent.) solution, and the saline emulsion was taken up for inoculation of other animals. An account of this will be given immediately. The other nodule (on the left side), which was left alone for observation, grew further for about two months of its appearance to the size of a small raisin, remaining always firm and freely movable under the healthy skin. After this period, however, the nodule began to show signs of a gradual diminution, and in six weeks' time got completely absorbed, so that four months after its first appearance not a trace of it could be detected. The animal showed no general symptoms of disease, and, as stated above, is even now quite healthy, the only demonstrable sign of its having had kala-azar infection being a definite but feeble agglutinating power its blood serum showed to a young and active culture of flagellates (about two months ago).

The nodule which was excised showed in sections the structure of a young fibroma or granuloma, surrounded by loose fibrous tissue. There were no vessels inside the tumour, and the central portion showed a more dense disposition of granulation tissue cells than the peripheral parts. In the extremely thin portions of the sections a few parasites were clearly seen lying free, as well as packed in macrophages. The emulsion made out of the other half of the nodule was injected intraperitoneally as follows: (*a*) About 0.25 c.c. into each of two tame mice; (*b*) about the same quantity into a *Macacus sinicus*. The fate of these animals, as also of the parasites they had received, is represented below in a tabular form.

N.B.—The nodule of *Macacus III* was not very rich in kala-azar parasites, *i.e.*, a smear from a nodule directly on a slide showed about twenty parasites for each slide, so that the dose given to monkey X, as also to mouse 11, can be taken as a minute dose, and by no means massive.

BATCH I.—TAME MICE AND MACACUS SINICUS X.

Animal	When and how infected	Result	Remarks
Mouse (14), white	July 17, 1912, 0.25 c.c. intraperitoneally	Died September 1, 1912	Kala-azar parasites—round forms—found *post-mortem* in liver, spleen and bone-marrow; therefore it died of a generalized kala-azar infection.
Mouse (13), black and white	,, ,,	Killed September 4, 1912	Kala-azar parasites, oat-shaped, found in liver, spleen and bone-marrow; therefore the animal had a generalized kala azar infection at the time of killing.
Mouse (11), black and white	July 4, 1912, a mere trace of the juice from the nodule of *Macacus* III obtained by needle puncture and diluted with saline	Killed September 30, 1912	Kala-azar parasites—round forms—found in spleen, liver and bone-marrow; therefore it had a generalized infection of kala-azar at the time of killing.
Macacus sinicus X	July 17, 1912, 0.25 c.c. of the emulsion of nodule of *Macasus* III in saline	Liver aspirated December 2, 1912, *i.e.*, 4½ months after infection	Animal well apparently. Smear from liver blood found to contain typical kala-azar parasites about 8 per slide and 2 macrophages in 6 slides, each containing 3.

The fate of the parasites in the mice of Batch I which had a generalized infection:—

The liver and spleen of mouse 14 was removed eight or ten hours after death, and an emulsion made in saline and injected intraperitoneally into mouse 15 on September 1, 1912. This mouse was killed on October 17, 1912, and, strange to say, no Leishmania were found in its liver, spleen, or bone-marrow smears.

The livers and spleens of mice 13 and 11 of Batch I were also crushed in saline, and the emulsion injected intraperitoneally on September 4, 1912, into mice 16, 17, and into Nos. 20 to 23 on September 30, 1912, the results being given in the following tables.

From the results of the mice of Batch I and Batch III, it appears that, although the material

* From the F. D. Petit Laboratory, Byculla, Bombay.

BATCH II OF TAME MICE.

Animal	When injected	Result	Remarks
Mouse 16, white	September 4, 1912 ...	Died September 15, 1912	No definite parasites; round coccal bodies with a large nucleus found; altered parasites?
Mouse 17	,, ,, ...	Killed October 27, 1912	Liver, spleen and bone-marrow quite free from parasites.

BATCH III OF TAME MICE.

Animal	When injected	Result	Remarks
Mouse 20	September 30, 1912	Found dead October 30, 1912 ..	Decomposed when examined eight hours later; liver and spleen quite soft and greenish owing to *post-mortem* decomposition; no parasites seen.
Mouse 21	,, ,,	Living and well, December 14, 1912	
Mouse 22	,, ,,	,, ,, ,,	
Mouse 23	,, ,,	Killed November 20, 1912	Liver and spleen smears show dots, but no definite parasites.

used for infection did contain the parasites, no infection was evident in the mice examined, and the negative result seems to be attributable to one or more of the following possible causes:—

(1) The time of the examination of the animals may have been too early for the infection to be fully established, although fully seven to nine weeks were allowed in each case, *i.e.*, more than what was necessary for a generalized infection of mice of Batch I, and far more than was found necessary for kala-azar infection of mice by Laveran [2], *viz.*, four weeks.

(2) The possibility of the attenuation of the virus by passage into mice.

(3) The possible curative effect of the extract of the liver and spleen which had to be introduced simultaneously with the parasites in the emulsion used for infection.

Besides the infections induced so far as indicated in the above lists, I have to record a local pinhead nodule induced in a fresh *Macacus sinicus* (VII) at the seat of cutaneous infection with the juice of a similar pinhead nodule of *Macacus* (VI), an account of which was given in my last memoir [1]. Here the incubation period was found to be five months. The nodule contains fully formed typical parasites with flagellate forms in culture.

Dogs, rabbits, guinea-pigs, and wild mice have been found by me to be refractory to small doses of the virus given intraperitoneally, or massive doses of the culture given intraperitoneally or subcutaneously during these nine months of observation.

CONCLUSIONS.

(1) From the above it is clear that of the animals experimented on, only *Macacus sinicus* and tame mice can develop a generalized infection of kala-azar with a minute dose of the virus.

(2) The way by which one can induce a generalized infection is by intraperitoneal injection.

(3) The parasites seem to lose their virulence in mice by passage.

(4) The dog, the rabbit, the guinea-pig, and the wild mouse seem to be refractory to kala-azar virus.

(5) The intracutaneous and subcutaneous infection of kala-azar virus, as well as culture, produces in the monkey a well-defined localized lesion of the nature of young fibroma. This lesion gets ultimately absorbed, leading to no general infection or any constitutional disturbance in the animal, as far as can be gathered from the observation of the general state of the animal and the condition of its hepatic blood five months after the appearance of the nodule, and ten months after the day of infection.

(6) The incubation period required for the production of a general infection or a local infection in the monkey has been found by me to be about five months, while that for tame mice is about seven weeks.

REFERENCES.

[1] R. ROW: JOURNAL OF TROPICAL MEDICINE AND HYGIENE, November, 1912, and *British Medical Journal*, November 2, 1912.

[2] LAVERAN: *Comptes Rendus des Séances de l'Academie des Sciences, February* 26, 1912.

The Wassermann Test in the Tropics.—Bates discusses this question in the *Archives of Internal Medicine*, vol. x, No. 5, November 15, 1912. He concludes his work under the following six headings:—

(1) Guinea-pig serum must be tested for native anti-human hæmolysin in certain localities and all sera in which they are found discarded.

(2) Malarial infection does not affect the Wassermann reaction (Noguchi modification).

(3) Cases of filariasis, yellow fever, blackwater fever and amœbic dysentery all gave negative reactions. Their number was too small to draw conclusions from however.

(4) Two out of three uncomplicated cases of yaws gave positive reactions.

(5) The Wassermann test is of great value in cases of arthritis of uncertain etiology.

(6) The Wassermann test should be made an aid to the pathologist in a considerable number of autopsies.

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JANUARY 1, 1913.

OLIVE OIL IN ITS RELATION TO MEDICINE.

FROM several sources lately we have had brought to our notice specimens of olive oil with information that it is pure and therefore suited in every respect for medicinal purposes. The writer for some years now has written and spoken about the deleterious consequences of the varieties of "oils" which are supplied in our markets, and brought forward the idea that "sprue" and, perhaps, other gastro-intestinal troubles were caused by the "oil" used by native cooks in preparing food for Europeans. Be this as it may, there is no doubt that olive oil varies in composition, in the amount of adulteration, and according to the extent that "purification processes" are applied to the crude oil, so does it vary in taste, in colour, and physiological effects.

As to the possibility of adulteration, we have only to look to our text-books to see that inferior brands are obtained (1) by adding the results of boiling the pulped fruit; (2) by fermentation processes; (3) by the addition of cotton-seed oil; (4) by sesame oil; (5) rape oil; (6) arachis oil; (7) and other substances, such as hydrocarbon oil. This formidable array shows that olive oil is a more expensive article to produce than any one of these mentioned as being used to simulate it and take its place. As usual, cheapness is the all-conquering cause of this masquerade of accessory articles for a natural product; it is the factor, indeed, which leads to adulteration and substitution in every branch of commerce and tends to warp man's honesty and blur his regard for truth. Health and human life are neglected factors in the race for wealth; the manufacturer of this and that specially prepared article advertises the excellence and cheapness of his product and the consumer regards the cheapness with favour and neglects to consider the "excellence." The only barrier to the use of deleterious products is the doctor, and he is only called in when the damage is done, when the gastro-intestinal tract presents some one of the many consequences of unsuitable and irritating foods. The death certificate obscures the finding, and the evil proceeds. This seems a roundabout way of getting at the truth concerning olive oil, but olive oil is so universal an article of diet, so useful as a medicine, so widely used in compounding drugs, that its purity is perhaps of as much account as a pure milk or meat supply.

Cheapness is the root of all the evil. When asking chemists for a better olive oil than that generally sold, one is informed it is a question of price; the ordinary form costs, say, a shilling a pint, the better quality one shilling and sixpence. A *whole* sixpence difference between a poisonous and a wholesome oil; what a price to pay! But even at this "enhanced" price, are we sure of the quality of the oil? By no means, we are still far off the best oil, and for medicinal purposes it is the best we want. Olive oil is bought wholesale by the ton, and the price varies from some £70 for the cheaper, that is the ordinary oil we use on our tables, to £120 for the "so-called best"; but for really the best, the price is some £20 to £25 more. The best olive oil cannot be supplied at 1s. a pint, nor at 1s. 6d. a pint, nor yet at double that price. When health is really considered, when disease has to be contended with, the price should not, and will not, stand in the way. Given an honest dealer who can guarantee a pure olive oil, be the price 10s. a pint, that, and that oil only, will be recommended by the medical profession, and in prescribing the oil let the producer's name be appended in the prescription to the oil, so that its substitution becomes an irregularity, not to say a fraud, and therefore a punishable act. The writer has urged this upon several importers of olive oil and advised them again and again that price has nothing to do with the matter could they only guarantee purity.

Olive oil for table or medicinal use has to be "prepared"; the oil as originally expressed cannot be so used, it is disagreeable to taste and repulsive in both its smell and flavour. The "refinement" implies expense, so that in comparison with the crude forms of oil increased in bulk by inferior (cotton-seed and other) oils, one must be

prepared to pay. In many ailments olive oil is of value, especially in constipation, in duodenal ulceration, in gall-bladder troubles, including gall-stones and jaundice from various causes and several other common afflictions.

As an article of diet it is used freely, more especially in the preparation of salads and salad dressings. The indigestibility of salads is proverbial, and one blames the vegetables comprising the salad as the source of the trouble, whereas the impurity of the salad oil poured over the vegetables or in the salad dressing is much more calculated to upset the stomach and produce subsequent gastric catarrh. We are indebted to several firms for the attempt they have made to place a pure oil on the market and to none more so than to Messrs. Cozenza and Co., of London.

Were the consideration of oils extended, the question of the adulteration of Macassar oil would not be amiss. As the basis of oil for the hair the adulteration of this oil must be of importance when the question of its action upon the hair and the production of baldness is considered. It is popularly believed that the application of oil to the hair hastens the falling of the hair, and this can be readily believed when we know to what an extent acrid oils are introduced into the composition of macassar.

J. C.

Annotations.

The Sanitary Organization of the Isthmian Canal.—Colonel Gorgas, in a recent number of the *Journal of the Association of Military Surgeons of the United States*, describes the sanitary organization of the Isthmian Canal, especially as it bears upon anti-malarial work.

The United States on the Isthmus of Panama, Colonel Gorgas says, owns a strip of land ten miles wide (of which the canal is the centre). This strip extends about forty-five miles in length from north to south. The population to be protected against malaria consists of about fifty thousand labourers and their families, and is scattered all over this five hundred square miles, though they are principally collected along the line of the canal, and more particularly into some forty camps and villages near this line.

The temperature, rainfall and character of terrain are all excellently suited for the breeding of anopheles all over this territory. The temperature is the same all the year round, and high enough for mosquitoes to breed freely in every month in the year. The rainfall averages over a hundred inches yearly, and though there are four months in which there is practically no rainfall, there is enough water for the anopheles to breed freely during these four months.

The line of the canal passes through low and swampy ground for about one-third of its length, and through hilly ground the other two-thirds, but streams are so numerous in the high ground that anopheles breed about as well here as in the low ground.

During the five years of the American occupancy of the Isthmus two hundred and fifty thousand people have been brought in, and as these have been located principally in places formerly unoccupied along the line of the canal, and as the villages are intended for only temporary occupancy, the conditions are a good deal like those of an army going into a new country; and Colonel Gorgas thinks that the experience at Panama may be useful in the military occupation of tropical countries.

The anti-malarial measures consisted of:—

(1) Destroying the habitat of the anopheles during the larval stage within a hundred yards of dwellings.

(2) Destroying within the same area all protection for the adult mosquito.

(3) Screening all habitations so that the mosquito cannot have access.

(4) Where breeding places could not be done away with by draining, use was made of crude oil, Phinotas oil and sulphate of copper for the destruction of larvæ.

These measures are based upon the knowledge that the anopheles larvæ only live, as a rule, in clear, fresh water, in which there is a plentiful supply of grass and algæ, and that the adult is weak on the wing, not generally flying far, and needs an abundant supply of grass and brush for protection against the breezes.

For the purpose of carrying into effect these measures, the five hundred square miles of territory was divided into seventeen districts. These seventeen districts were under the charge of a chief sanitary inspector, who had in his office the necessary clerical force and three assistants. One of these assistants was especially competent in the life, history and habits of the mosquito; another in knowledge of ditching, tile draining, &c.; and the other in knowledge of general executive work. Each of the seventeen districts had a district inspector in charge. Each district inspector had a sufficient force of labourers (forty to fifty) to do the necessary ditching and draining; a force of carpenters to keep the screening in repair; and one or two quinine dispensers, who were kept constantly going round giving three-grain doses of quinine to those who wished it. No force was employed to make the employees take their quinine prophylactically. The three assistants were kept constantly going over the work, advising and instructing the district inspectors.

The district physician sent in daily to the central office a report, showing the number of malarial cases occurring in his district and also the number of employees from which these malarial cases come. This report, consolidated weekly in the central office, showed the number of cases of malaria and per cent. of malaria. A copy was sent to each

district inspector and he was held responsible for any excess of malaria in his district. If the admission rate for malaria during the week rose above one and one-half per cent. something was considered wrong, and the assistants to the chief sanitary inspector were sent down to look over the ground and try to discover the cause.

The district inspector, for the purpose of doing away with the breeding places of larvæ, put down tile drains wherever that was suitable. This Colonel Gorgas considers the most effective and economical form of drainage. After it is once in, it requires no more attention. There is no breeding place left for mosquitoes, as no water whatever is exposed at the surface. A horse mower or scythe can be used for cutting the grass over it. Where tile drainage cannot be used open concreted ditches were adopted. The first cost of this was nearly as great as that of tile, and a certain amount of labour was necessary to keep it clear. It had to be swept out once a week to prevent obstructions, making little puddles of water in which the mosquito will breed. If the ground could not be drained in either of the above ways, open ditches were used. This is the least effective and most expensive form of drainage. In Panama they rapidly fill up with grass and have to be cleaned out about once in two weeks.

For the purpose of doing away with places which might harbour the adult mosquito, the inspector cleared the ground of brush and grass for a hundred yards around the place to be protected. Where the locality was to be occupied for a year or more, it was more economical to grade the ground and plant grass. The grass could then be kept down with a horse mower or scythe. A limited amount of shrubbery or a few trees about a dwelling are allowable.

The inspector kept the screens in repair by constantly going over them with his force of carpenters. The usefulness of screening depended entirely upon the care as to details with which it was put up. As put up by the ordinary carpenter, without expert supervision, it was of comparatively little use. Good wire should last, on the Isthmus, at least three years, although there is plenty of screening on the market that will not last six months.

Prophylactic quinine was furnished in three-grain doses either in solution, in the form of a tonic, or in pills. It was placed on the table at all the messes, and given to any employee who applied for it. Besides, from one to three dispensers in each district went round to the various villages offering quinine to all employees who would take it. In this way about twenty thousand doses were taken daily when forty-five thousand people were being employed. Prophylactic quinine is a most important measure.

Phinotas oil and sulphate of copper were used in such places as could not be drained. Oil was used in temporary pools caused by construction, or at temporary camps where it would not be economical to drain, and in all places where for one reason or another drainage was not done. Phinotas oil was used for killing the larvæ in the algæ and grass, along the edges of lakes or swamps or the banks of streams. Sulphate of copper was used for killing the algæ in similar places. A very small amount was found to accomplish this efficiently.

Under the above plan the malarial rate was affected as follows:—

Year	Force	Number of cases admitted to hospital	Number of cases per thousand	Number of deaths	Number of deaths per thousand
*1904	6,747	422	125	9	2.66
1905	16,511	8,496	514	92	5.57
1906	26,705	21,938	821	199	7.45
1907	39,344	16,709	424	138	3.51
1908	43,890	12,372	282	59	1.34

* 1904 commences with the month of July.

Colonel Gorgas thinks that these methods could be applied in a considerable extent to military organizations. When troops are on the march in a malarious country the only practical protection would be prophylactic quinine. The only exposure to malarial infection would be in case they were billeted in some town. With a fresh camp every night it would not be probable that such anopheles as bit them would be infected. Where troops remained at one camp for a week or longer it would be practicable to clear and drain the ground.

The most important practical point in this class of work is that the sanitary officer should do the work himself. The men doing the ditching, brush cutting, &c., should be immediately under his control and he should be held responsible for the proper performance of the work. Colonel Gorgas's experience has impressed upon him the fact that usually the officer in charge of this work has no special knowledge of mosquito life and habits and does not give due weight to details resulting therefrom. In general the laity are inclined to look upon the minutiæ of such work as trivial, and more or less ridicule is cast upon them.

As education extends it is possible that such work may be turned over to the engineer, or the quartermaster, or the provost of the camp, but at present Colonel Gorgas would always make it a *sine qua non* that the sanitary officer be held responsible for the proper execution of the mosquito work in all its details, and, in order to enable him to properly carry out these details, he should have immediate control of the working force. Unless this is done the work is foredoomed to failure. The sanitary officer then should do the mosquito work himself, and not merely advise some other officer as to how it should be done.

This interesting and valuable paper should be carefully studied by all tropical sanitarians. Similar results can be obtained in other parts of the world quite as much as in the Isthmus, provided that the same care and attention to detail are bestowed upon the work.

The destruction of disease-bearing insects.—Harris and Ellington, in the *Australasian Medical Gazette* for October 26, 1912, contribute a paper on the important subject of the reduction and destruction of disease-bearing insects. As regards mosquitoes, they say that this question can be summarized briefly enough, and has been well stated by the American Mosquito Extermination Society. For Queensland it may be put as follows:—

(1) There are some forty or more described species of mosquitoes in Queensland. Not all suck the blood of human beings. Of those species which do, only the female pursues this unpopular practice.

(2) Mosquitoes breed only in water. They may breed in any kind of quiet water which is free from their natural enemies, such as small fish, water-beetles, &c., or which is so shallow or grass-grown at the edges that their enemies cannot get at the larvæ.

(3) Mosquitoes generally require from two to three weeks to develop from eggs to winged insects in warm weather, longer in cold weather. The eggs of some species (*e.g.*, *Stegomyia*) can survive for many months, and it is probably in this way that these species pass through the winter. The larvæ of several other biting species can survive the cold weather, remaining in a sluggish condition in sheltered water.

(4) The adult female insect may live for several months, and some species appear to hibernate in small numbers in cold weather.

(5) Mosquitoes do not breed in grass or undergrowth, but rank growths often conceal breeding puddles, and these also often form favourite harbouring places for the adult insects. The usual breeding places for domestic species, such as *Stegomyia calopus* and *Culex fatigans*, are in or very near houses—the tank, for example, or a defective section of roof-gutter, or a puddle, or an empty can, or a neglected flower vase or water-jug.

(6) Different species of mosquitoes have as well-defined habits as different kinds of birds, flies, or animals. Some are domestics, some wild, some migratory.

(7) Most domestic mosquitoes breed in fresh water, fly short distances, and habitually enter or live in houses.

(8) Most migratory mosquitoes (such as the Scotch Grey) breed in salt or brackish swampy areas, and can fly long distances.

(9) The most accurate and precise tests have proved that certain kinds of mosquitoes are the only known natural means by which yellow fever and malaria are transmitted. Some other diseases (for example, filaria, which is frequently met with in Queensland) are also conveyed by mosquitoes.

(10) The conveyer of yellow fever (*Stegomyia calopus*) is common in Eastern Queensland, as is that of filaria (*Culex fatigans*). The malaria-conveying Anopheline mosquitoes occur also in parts of Queensland.

(11) Mosquitoes are unnecessary and are very dangerous pests. Their breeding can be largely prevented by such methods as screening tanks with fine wire gauze, by draining or filling in puddles or pools which serve as breeding grounds, or by oiling these with kerosene or other effective larvicide, or by stocking them with small fish. Before ascribing a bad reputation to such places, it should be ascertained whether mosquito larvæ are actually to be found in them.

The removal, emptying, or screening of tanks and water receptacles is essential. They should be oiled with kerosene (about a tablespoonful to each ordinary tank, or a dessertspoonful to each square yard of water surface) once or twice a week, if they cannot be screened or removed.

Attention should also be given to cisterns, wells, flower vases, water-jugs, flower pot saucers, drinking places for birds or animals, ant-saucers, cesspools, roof-gutters, drains, water-troughs, gutters, old cans, holes in trees, bamboo clumps with broken or perforated joints holding water, puddles, drip places from taps, drain-traps, and similar small collections of water about houses.

(12) Adult female mosquitoes in a house will continue their bloodthirsty habits for some time after their breeding places are destroyed. They shelter during the day in presses, wardrobes, curtain folds, and similar dimly-lit places. Their sheltering places should be located, and clothes, curtains, &c., removed to drawers or boxes if found to harbour them.

Various fumigating preparations can be obtained, and should be used in the shelter places. A sheet of paper should be laid at the bottom of the press, &c., before fumigating, and all mosquitoes found on it afterwards folded up in it and burned.

The continued breeding of any kind of mosquitoes in inhabited places is a menace to the health, life, and comfort of man and beast alike. It is therefore ignorant and neglectful to allow it to continue.

Bubonic Plague in Havana.—Guiteras in *The Journal of the American Medical Association* for November 16, 1912, reports three cases of bubonic plague which occurred in Havana. He describes the present sanitary conditions of the city, and states that the conditions are favourable for the control of the disease. Of 8,909 rats examined in Guiteras's laboratory none were found plague infected. Kitasato, the author says, has drawn attention to this fact that it is not rare to have summer epidemics of plague without finding plague rats. Another point in favour of the disease being stamped out quickly was that it appeared in summer, a time when the flea population of rats is at its lowest in the Tropics. Guiteras has bred the *Læmopsylla cheopis*, the common rat flea of Havana, for several years, and the decrease in their numbers in summer has been very striking. A detailed report of the bacteriological work in connection with these cases will be published later by Dr. Lebredo, who was in charge of that part of the work, and the reports of other heads of departments will be published also in *Sanidad y Beneficencia*, the official organ of the department.

*Schistosomum japonicum.** — Miyakawa made a statistical investigation of the relation of schistosomiasis and dermatitis, using a modified Telemann's method for finding the eggs of the parasite in the fæces; and tried to determine the way in which the infection occurs and the mode of its propagation. He also studied the method of prophylaxis and came to the following conclusions:—

(1) The dermatitis, which occurs in regions where schistosomiasis is prevalent, is a dermatitis showing a few peculiarities. Its cause can be ascribed to a mechanical as well as to a chemical stimulation.

(2) The modified Telemann's method is as follows; a mixture of 50 per cent. HCl and an equal quantity of ether is used to select the parasite's eggs from the fæces, and then centrifugalized and the residue examined for the eggs. By this method the destruction of the eggs is much less than in Telemann's method, and there is no danger of explosion.

(3) Nineteen out of 49 persons who had been found to harbour no schistosomum eggs at the first examination were discovered to be infected after 50-60 days. From these 19 persons, dermatitis was found in 9; and from non-infected persons in 19 cases: thus the dermatitis occurs more frequently in those who have no eggs than in those who have eggs in the fæces.

(4) The author and his assistant suffered from dermatitis in this year, but up to the time of writing no eggs had been found in their fæces.

(5) A servant of the institute bathed, as an experiment, in a brook and in water in a rice field, which were believed to contain the cause of the dermatitis, and contrary to expectation he never had a trace of dermatitis, but developed schistosomiasis.

(6) A similar dermatitis is observed in regions where there is no schistosomiasis.

(7) The histological changes in this dermatitis are quite different from those in skin which contains young worms; and in the former one never finds traces of the passage of the worms. From these observations it can be concluded that there is no causal relationship between dermatitis and *Schistosomiasis japonica*.

(8) One cannot infect dogs in which an acute gastric catarrh has been artificially produced, or patients, by pouring a large quantity of the infected water into the stomach.

(9) The young forms of *Schistosomum japonicum* seem to live more in the bed of the stream than in running water, but mud does not appear to contain a perceptible quantity of the worms.

(10) Infection by Schistosomum is not observed in swampy regions, though the infection seems to be localized in places where there is plenty of water.

(11) The cause of the infection is present to a greater extent in brooks and freshly watered rice fields than in stagnant rice fields.

(12) *Chininum muriatum* has no prophylactic action against this disease as was once believed.

(13) Thick woven cotton cloth prevents infection to some extent.

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Abstracts.

The Diagnosis of Pellagra.

C. H. Lavinder, writing in a recent number of the *American Practitioner*, points out that pellagra has been reported now from all parts of the United States. The disease seems to be constantly extending its area. Its early diagnosis is important; for treatment in the early stages gives more hope of good results, and, moreover, in a malady of such protean character, errors of diagnosis are easily made, and may involve distressing tragedies, since many cases have suicidal tendencies.

The diagnosis of the disease in a well-marked case, fully developed, offers no difficulty, but the early cases, and cases which do not show typical symptoms, not infrequently present the greatest difficulty in arriving at a conclusion. The diagnosis must depend upon the history, symptoms, and development of the disease, for as yet we have no precise laboratory methods which will give confirmation. Many attempts have been made to devise some precise method of diagnosis, but so far none has proven satisfactory. It is of interest to note, however, that recently Volpino has presented a communication claiming that, on the basis of extensive experiments, he has established the presence in pellagrins of an anaphylactic reaction to extracts of spoiled corn. This reaction consists of a rise in temperature, acceleration of the pulse rate, often vomiting and increase in intestinal peristalsis with, at times, the passage of bloody stools, psychic phenomena, and sometimes the aggravation of pre-existing erythemas. His controls did not present these phenomena. He suggests the use of his method in diagnosis. His work will, of course, require confirmation. Previous similar attempts by others along this line of work have given negative results.

Pellagra is an endemic disease characterized pathologically by serious organic changes in the central nervous system, and clinically by a chronic course with periodic manifestations of acute phenomena referable to (1) the gastro-intestinal tract; (2) the nervous system; and by (3) the appearance of an erythematous exanthem on certain exposed body surfaces. The disease frequently leads to insanity or to a fatal cachexia. The striking characteristics of the malady are its chronicity and protean type, the seasonal appearance of its striking skin eruption with acute symptoms, and the "pellagrous triad," *dermatitis, diarrhœa, dementia.* The essential morbid process involves the central nervous system, and this conception of the disease is fundamental.

The disease is a slowly progressive one, and may be divided into prodromal, first, second and third stages. The prodromal stage is indefinitely marked both in length of time and symptomatology; the first stage has reference to the gastrointestinal and skin symptoms; the second stage concerns the cerebrospinal and psychic phenomena; and the third stage is the terminal one of cachexia. There is no

sharp line of demarcation between the stages; nothing is implied as to the length of time the disease may have existed; and the stages represent rather differences in degree than in kind. Pellagra runs its course in a series of periodic attacks—alternating ameliorations and exacerbations. The exacerbations occur, as a rule, in the springtime, sometimes in the fall or even at other seasons, and subside after a time, only to recur again the next year. Following the somewhat indefinite prodromal period, there arise next gastrointestinal and nervous disorders, usually accompanied in a short while by the striking erythema. The brunt of the successive attacks is borne by the nervous system, and each annual recurrence leaves a deeper and more ineradicable impression upon the nervous and mental condition of the sufferer.

The skin eruption when present is pathognomonic. This striking symptom is so much in evidence that it has given the disease its name: and its peculiar characteristics are of such weight in diagnosis, that they must be considered somewhat in detail.

(1) The pellagrous eruption is an erythema in the dermatologic sense of that word.

(2) The erythema, as a rule, appears suddenly, and its genesis is not necessarily connected with solar or atmospheric influences. Often its origin can be traced to solar influences, applications of various irritating substances or even pressure, as, for example, on elbows and knees, which should always be examined.

(3) The edge of the erythema ends in a typically marked red border, delimiting it sharply from the healthy skin beyond.

(4) In its evolution it rather develops a broad zone of scaling which is quite characteristic of the process. As a rule it does not reach its height for several days, and requires even a longer time in its retrogression, which ultimately occurs by first loss of the rosy border, then gradual fading of the centre, while the scaling and crusting zone remains still longer the seat of the receding process. Exfoliation may take place with the shedding of the large areas of epidermis.

Some cases show bullous formation with early loss of epidermis, and consequent raw, bleeding surfaces which readily become infected. At times during the receding process ulcers and painful cracks and fissures may develop, and even gangrenous processes may be rarely seen.

(5) One of the most striking characteristics of the eruption is its symmetry and distribution. It is nearly always markedly symmetrical and shows certain places of predilection. These are the backs of the hands and of the feet, the face, and the neck—those places most exposed to atmospheric influences. Many descriptive appellations have been given to the various localizations of the erythema, such as "glove," "gauntlet," "boot," "neckband," "cravat," "mask." In addition to these favourite spots the eruption may exist elsewhere and may even be generalized.

(6) The erythema on its first appearance is usually a fairly bright red, almost like a sunburn, and the part is a little puffy. In a short time this colour often takes on a bluish or "plum" tint. Then, in the course of further changes, the whole passes to a reddish brown, or sepia, or bronze tint, which is very characteristic.

(7) Itching is usually absent and never marked. The part burns and has a tense, uncomfortable feeling, but does not show scratch marks.

(8) The seasonal appearance of the eruption is important. As a rule, it appears but once annually, at springtime or in the fall. It may occur at both seasons in the same individual, but this is unusual. It may also occur rarely in the winter months.

(9) With early attacks the skin, after the disappearance of the eruption, resumes its normal appearance, but recurrences lead finally to trophic changes.

(10) Notwithstanding the importance of the skin symptoms in diagnosis, the associated constitutional manifestations should be sought for and given due weight. Cases may occur with only the skin eruption, and in some localities such cases, especially in children, are not rare.

Pellagra is reported without any skin lesions, so-called *pellegra sine pellegra*. It is a matter of much doubt whether a pellagra ever occurs without skin symptoms at some period of its evolution. It is no rare thing, however, to meet cases presenting the clinical features of the disease without skin manifestations. The diagnosis under such circumstances is by no means certain.

Pellagra in its chronic course often displays certain very acute and rapidly very fatal explosions—not always easy of diagnosis if the patient has not been seen before the onset of the acute condition. Most typical of these fulminant attacks is the condition called by the unfortunate name of typhoid pellagra. There occur other allied acute conditions. These may prove extremely puzzling unless one have pellagra in mind and make careful inquiry into the history of the case and scrutinize the skin for evidence of a past erythema.

The psychic manifestations of pellagra are very common and very important. Neurasthenic phenomena often usher in the disease, and the diagnosis remains in doubt until the later appearance of the erythem. Other psychic states must not be neglected.

The Etiology of Blackwater Fever.*

By Sir William Leishman, F.R.S.

(*Continued from p.* 380, *December* 16, 1912.)

II.

The author had already given an account of the cell-inclusions encountered in the blood from cases of blackwater fever, in two notes in the *Journal of the Royal Army Medical Corps*, accompanied by illustrations. In those notes he dealt with the results of his examination of films of blood from three cases; since then he had had the opportunity of examining films from eight other cases, making a total of eleven.

The cases from which these blood films were taken occurred in the following places: Uganda (Kampala

* A paper read at the Society of Tropical Medicine and Hygiene, October, 1912.

and Entebbe), Sierra Leone, Gold Coast (Quittah), South Africa (Rand), Lagos, and Southern Nigeria.

In two instances, films taken on successive days after the onset of the disease were available for study, but in no case was there a sample of the blood before the onset of hæmoglobinuria. The majority of the films were accompanied by a note of the clinical symptoms, treatment, &c., but in some this was not available. In the majority, the clinical account gave a clear and characteristic picture of a typical attack. The only other point needing mention is that in those instances in which malarial parasites had been searched for none had been found. In connection with this last point, it may be added that in all but two of these cases the author confirmed this absence of parasites; in one he found a pigmented leucocyte, and in the other a few rings, after several hours' search, a time which naturally the busy colonial surgeon can rarely afford.

The general aspect of these films showed no great uniformity. In most there was a leucocytosis, usually polynuclear in character, and there were almost always present, sometimes in very large numbers, a peculiar type of very large mononuclear cell with coarsely reticular protoplasm, which he believed to have been of endothelial origin. There were other curious cells, which may or may not have some significance.

The small number of cases and the want of uniformity in the time of taking the films render futile any attempts to draw conclusions as to the usual blood picture during the attack. This, however, is of little moment, since so many valuable records already exist in connection with this subject. The author notes the frequency with which he encountered neutrophil myelocytes, normoblasts and megaloblasts and Türk's cells as pointing to the involvement of the marrow, but whether this points to a primary affection of this tissue, or is only an indication of the rapidity with which compensatory mechanism comes into action, he is unable to say.

As to the inclusions, these were encountered principally in the large mononuclear cells which he takes to be endothelial in origin, and to have been disrupted from the walls of the smaller blood-vessels or lymphatics; in some instances they were also seen in cells of a smaller type which it was not easy to differentiate from ordinary hyaline leucocytes except that the nucleus of such cells was almost always in close contact with one portion of the cytoplasmic periphery, a rare occurrence in ordinary hyalines. They were not found in polynuclears, eosinophiles, or lymphocytes. The cytoplasm of the cells which harboured inclusions was faintly basophile, and appeared somewhat coarsely reticular, much more so, at all events, than the clear hyaline cytoplasm of the large mononuclear leucocytes. Granules, as a rule, were not seen, but, in some instances, very fine granules, taking a reddish tint with the Romanowsky stain, were noted, seldom evenly distributed, but more often collected in irregular clumps or patches.

The inclusions themselves exhibit a considerable variation in shape, size and staining reaction, and their appearance may be gathered from the plate illustrating the author's first note. They do not resemble in any respect the azur granules of mononuclear leucocytes. They are small bodies, almost invariably circular in outline, and ranging from 1 to 5 microns in diameter, the great majority, however, measuring from 2 to 3 microns. They present themselves usually in one of two forms—a structureless, homogeneous form and a ring form; the former, which is the commoner, usually assumes a faint chromatin colour or a greyish tinge with the Romanowsky stain, and, more rarely, a deep chromatin tint. The ring forms, which are rarer, are almost always coloured a deep pink, similar to the chromatin of protozoa. In all cases the inclusions were embedded in the cytoplasm of the cell and not adhering to its periphery. At times the inclusions were seen to be lying in vacuoles, but more often this was not the case. The exceptionally large inclusions figured in connection with the author's first case have not subsequently been encountered.

As regards their frequency in a given case they are never abundant, several hours' search over a film frequently revealing only two or three. In the cases in which they were most numerous they were found in about one endothelial (?) cell in twenty. Cells containing several inclusions were more frequently seen than those with a solitary one.

Of the twelve cases of blackwater fever of which blood films had been received, these inclusions were found in eight. In three cases they were not found, although in two of these cases the cells of endothelial type were present in abundance. In the third negative case no endothelial cells were found, and the clinical details, which were scanty, suggested a considerable doubt as to the correctness of the diagnosis. Only in two cases could the inclusions be said to be fairly common.

Curiously enough, the most numerous inclusions which were found in the blood were in films from a case occurring in Uganda which were sent to me, not as blackwater fever, but under the suspicion that it had been one of kala-azar. The author found, however, no parasites of this nature, either in the blood or in smears made from the spleen and liver after death. The case was moribund on admission and died shortly after this, and from the brief account of the symptoms and of what was found at the autopsy, there appeared nothing inconsistent with the suspicion that this, too, was a case of blackwater fever. If this were the case—a point impossible to settle now—it would have been of interest from the presence of the inclusions calling attention to its true nature.

In considering the nature of these inclusions the author is convinced from his study of them upon two points, that they are not artefacts and they have no connection with malarial parasites. Again, he had seen none which suggested to him the possibility of their being portions of nuclear material; nuclear extrusions or buds are by no means uncommon in connection with polynuclear and, less frequently, with

mononuclear nuclei, but these are usually in close connection with the nucleus, and generally united to it by a thread of chromatin.

The possibility of their being fragments of altered erythrocytes, previously phagocyted by the cells which show the inclusions, is one on which the author was not able to speak with such confidence. The cells in question undoubtedly exhibit the power of erythro-phagocytosis, of which he had observed examples in three of these eleven cases. He had even, in two or three instances, noted both inclusions and a red corpuscle in the same cell. In spite of this he did not think that this is their explanation, since he had often observed the changes which phagocyted red cells undergo—for instance, in the extensive phagocytosis of alien red cells, which can be studied *in vitro* by the opsonic technique, and he had never seen the remains of red cell assume either the shape or the staining reaction of the majority of these inclusions. It is quite possible that the inclusions in question are not all of the same nature, indeed this is rendered almost a probability by the very considerable differences in shape, size, and staining reaction which they exhibit.

Whether similar inclusions are to be encountered in the blood of other diseases, as has been suggested by Low, is a point for the future to determine; the author could only say at present, with a fairly large experience, that they are new to him.

Another peculiar cell which he had encountered in seven out of the eleven cases of blackwater fever, and which, personally, he had never seen before, were described in the author's second Note as "chrome cells," from the extraordinary deep tint of chromatin colour which they assumed on Romanowsky staining; not only was the nucleus exceptionally darkly coloured, but the whole of the cytoplasm took on a lighter tint of the same red colour. Their nuclei were sometimes of polynuclear, sometimes of mononuclear, type, and in size they corresponded to the ordinary polynuclear leucocyte. In most instances the chromatin tint of the cytoplasm was deepest round the periphery of the cell, and not infrequently can be noted an apparent diffusion of the red tint into the film surrounding the cell, although this was exhibited by no other type of cell in the particular film. In some cases the partial rupture of the cell allowed it to be seen that the cytoplasm had been filled with deep-staining chromatin granules, often in ring-form, and much larger than any of the usual types of granules encountered in leucocytes or marrow cells. The author was at first inclined to regard these cells as being in some manner connected with the inclusions, but since the publication of that note, he had received a communication from Dr. D. Thomson, of the Liverpool Tropical School, in which he had been informed that Dr. Thomson had observed similar cells in several different conditions, such as in Hodgkin's disease, in myelogenous leukæmia, sarcoma of the ileum, blood from leprosy nodules, and one or two others. Dr. Thomson had sent the author some of his films, and given permission to mention his as yet unpublished experience in this paper for which the author acknowledged his great indebtedness. Dr. Thomson had been much struck by their appearance, as he had never encountered them before nor seen them figured or described, and he had been inclined to suspect that the granules were parasitic, but he is now inclined to regard them as some form of altered mast cell. However that may be, Sir William Leishman was at least able to convince himself that some of the cells in Dr. Thomson's films were apparently identical with those that he (Sir William) had described as "chrome cells," and it is thus clear that they have no specific relationship to blackwater fever. However, such authorities as Sir Ronald Ross and Professor Adami had never seen them.

Returning to the inclusions and their possible nature, it was not unnatural that one should suspect that, like other inclusions, these might be an indication of the invasion of the cells by parasites of the class to which Prowazek has given the name *Chlamydozoa*. This view, with all reserve, he had suggested in his earlier notes, and it was with this hypothesis that he occupied the remainder of his paper. The author wished, however, to make it quite clear that he put this hypothesis forward more by way of a suggestion than from any confident feeling that it is likely to meet with greater success than has been the lot of its innumerable predecessors. The mere finding of certain cell inclusions in a few blood films may seem a slight foundation on which to raise a somewhat ambitious structure. At the same time he held that an occasional excursion of this sort may at times be permitted to the research worker, whose daily lot is toil and disappointment. If he should find among his audience some who, like himself, were not altogether satisfied with the current explanations of the etiology of blackwater fever, he could perhaps claim from them a certain amount of sympathy, if not of agreement.

The chlamydozoa, of which our knowledge is still in its infancy, are a class of minute, ultra-microscopic organisms, capable of passing through the pores of very finely grained filter candles, and frequently associated with the presence of what are rather vaguely termed cell-inclusions. The best known diseases supposed to be caused by these organisms are variola and vaccinia, trachoma, molluscum contagiosum and bird-epithelioma. In addition to the above, however, it seems far from unlikely that rabies, scarlet fever, measles, chicken-pox, and perhaps yellow fever, may eventually be shown to be due to organisms of this class. The cell-inclusions associated with molluscum contagiosum are the oldest known—the so-called molluscum bodies—but the Guarnieri's bodies of small-pox and the Negri bodies of rabies are more widely known. At first taken for the actual particulate causes of the diseases with which they are associated, it soon came to be recognized that this position was not tenable, for one thing their comparatively large size was inconsistent with the proven filter-passing capacity of the viruses of these diseases, but at the same time they have, in some instances at least, come to be recognized as in a sense specific to

the disease with which they are associated. As a matter of fact both the Negri bodies and Guarnieri's bodies are now held to be of considerable diagnostic value.

More recently certain extremely minute granules have been detected in the affected cells in trachoma, variola and molluscum contagiosum, and also in contagious epithelioma of birds, in rabies, in varicella and in both human and experimental scarlatina. Many of these observations are as yet lacking in detail and the very needful confirmation, but there appears little doubt that in some, if not all these diseases there occur, associated with the presence of the virus, extraordinarily minute granules, approaching the limits of microscopic visibility, and only demonstrable by special staining methods or by dark-ground illumination. In some of the diseases in question the proof that these minute granules are in reality the particulate cause of the disease appears to be very strong. As to the association between these granules and the cell-inclusions, demonstrated in the various diseases, the views of Prowazek and others may be outlined as follows:—

A small granule enters a cell, for example a conjunctival cell in trachoma, a nerve cell in rabies, or an epidermal cell in small-pox, and causes a reaction in that particular cell which is evidenced by the surrounding of the invading granule by a mantle or cloak (hence the name, which is derived from χλαμὺς, a cloak) of some secretion which eventually becomes sufficiently abundant to be stained and recognized as a Guarnieri's body, a Negri body, a molluscum body, and so forth. To the buried granule, which may or may not be visible, is given the name "initial body." The initial body then commences to divide, and there are formed from it great numbers of extremely minute granules, which may eventually escape from the inclusion and fill the cytoplasm of the cell. These products of division of the initial body are called the "elementary bodies," and it is held that it is in this form that cell to cell infection is brought about, and that the virus is carried from host to host. To their minuteness are also attributed the filter-passing properties which, in a number of these diseases, have been clearly shown to be a feature of the virus.

In no instance can it yet be said that all is known about the etiology of the diseases mentioned, but evidence is accumulating which goes to show that the chlamydozoa will eventually prove to be the cause of a number of diseases distinguished both for their variety and their severity.

The author suggests then, that some, if not all, of these cell-inclusions which he had described, may be of the nature of the inclusions surrounding the "initial bodies" of chlamydozoa.

There must now be considered what may be said in support of this hypothesis, and in how far it may be held as not inconsistent with the established facts relating to blackwater fever.

At the outset one finds the principal objection to the idea of a specific virus, namely, that no such virus has been seen, no longer applies, since the chlamydozoal hypothesis assumes the existence of an ultra-microscopical virus. Incidentally, it may be remarked that the hypothesis is not necessarily invalidated should it be proved that the inclusions to which attention has been drawn are capable of some other interpretation.

The clinical dissimilarity between blackwater fever and the diseases associated with chlamydozoa is freely admitted, but, on the other hand, the lack of resemblance is scarcely greater than we find among those diseases themselves.

The majority of the chlamydozoal affections are extremely infectious and tend to spread in epidemic form. The author had suggested elsewhere that this apparent discrepancy may be explicable if it is assumed that the ultra-microscopical virus of blackwater fever is limited to tissues and cells in the deeper parts of the body, in contrast to the known superficial site of the virus—for instance, in the skin lesions and affected mucous membrane of variola, molluscum contagiosum and trachoma.

Further comparisons of this sort, however, would not help much, since definite knowledge of the nature and mode of action of the chlamydozoa is still lacking, and, until this is available, it will be obvious that attempts to compare the known factors in connection with blackwater fever with the uncertain factors of these little-known micro-organisms would lack point and precision. He proposed then to limit this comparison to an examination of the conclusions reached in the first portion of his paper in the light of the chlamydozoal hypothesis, dealing with them in the order in which he placed them there.

(1) The general agreement that blackwater fever is only encountered in those who have either suffered from malaria, or who have lived for some time in a country in which they must constantly have been exposed to malarial infection. This appears to me to be the best established fact in connection with the disease, and unless a reasonable explanation is forthcoming, co-ordinating this fact with any new hypothesis, the latter must be regarded an untenable.

He would suggest that this association with malaria is comprehensible if it is assumed that the chlamydozoal virus is one which is transmitted either by the same insect which transmits the malarial parasite, or by a different insect whose habits and bionomics correspond closely to those of mosquitoes and whose geographical distribution is similar. No novelty was claimed for this suggestion, which must have occurred to many, but its possibility was enhanced in the light of the chlamydozoal hypothesis. It is known already that mosquitoes transmit at least four diseases, malaria, yellow fever, filariasis and dengue, so it was not asking much to assume them capable of transmitting a fifth. If we assumed further that the virus of blackwater fever is a rare parasite of mosquitoes in comparison with malaria, or that it is possibly limited more strictly than the latter to one or two species of mosquitoes, it is not difficult to account for many of the puzzling anomalies in connection with the malarial hypothesis—for instance, the facts that there is no direct relationship between the number of the malarial parasites in the blood and the severity

of the paroxysm of hæmoglobinuric fever, and that quinine has no effect in aborting or curing the attack.

He was also inclined to regard as significant the fact that two out of the four mosquito-transmitted diseases are shown to be due to filter-passing viruses, namely, yellow fever and dengue, while the virus of phlebotomus or three-day fever, transmitted by *Phlebotomus papatassii*, is another instance of the same nature.

(2) The second conclusion, referring to the immunity of natives in endemic areas, and the greater susceptibility of whites and of alien natives introduced into endemic areas, was not inconsistent with the new hypothesis on the assumption that immunity followed the same lines in the two diseases. If the virus of blackwater is much more rare than that of malaria, as suggested above, one had here an easy explanation of the fact that, as a rule, new comers are not attacked, and that prolonged residence is a feature in the incidence of the disease.

(3) The conclusion that immunity to malaria appears to go hand in hand with blackwater fever and that the measures which protect against the one are also effective against the other, supports the idea that the virus of the latter is also transmitted by a biting insect, similar in its habits to the mosquito.

(4) The fourth conclusion that there are apparent discrepancies in the geographical distribution of the two diseases, but that blackwater fever only occurs in intensely malarious countries is also explicable on the above assumption of a specific virus transmitted by some insect with a life habit resembling the mosquito, but either less numerous or more restricted in its geographical distribution. The rarity or absence of blackwater fever in certain districts heavily infected with malaria would thus find an explanation either in the absence of the particular transmitting species or in the fact that the carrier in that district was not at the time infected with the virus.

(5) The conclusion that some exciting or secondary cause is needed would appear to await further understanding and explanation, as is also the case with the sixth conclusion, relating to the mechanism of the production of hæmolysis. These two are evidently closely connected and it is probable that a common explanation underlies both. It is thought clear that, even if the chlamydozoal hypothesis be correct, it would still be found that secondary or exciting causes played a part in the production of the sudden and extensive hæmolysis. For example, there were cases on record in which a first attack of blackwater fever had occurred some weeks after the individual had left the endemic area and returned to a temperate country. Such cases would suggest, on this hypothesis, either that the virus had an exceptionally long period of latency, which appeared improbable, or that infection with the virus was not *necessarily* accompanied by the symptom of hæmoglobinuria.

It appeared from the above consideration of the agreed facts relating to blackwater fever, in the light of the chlamydozoal hypothesis, that there were none which were definitely antagonistic to its possible correctness while there were some which rendered our comprehension of those facts distinctly more easy. He had no wish to build too heavy a superstructure upon a foundation which he admitted was very far from stable, and he had put it before the Fellows as a suggestion and that he might have the benefit of criticism.

In conclusion, the author ventured to suggest that there was yet another way in which the connection between malaria and blackwater fever might conceivably be brought about. There was no reason why we should deny the possibility of the malarial parasite itself being subject to disease. The further we progressed in microscopical research the more inconceivably minute structures came to our knowledge, either by direct observation or by inference, and to his mind it was a bolder thing to assert that we had reached the limits of particulate life than to admit the possibility that there yet remained forms of life smaller even than the Chlamydozon granule.

Tropical Diseases Bulletin.

Part No. 3 of Volume I (December 15, 1912), deals with malaria, sleeping sickness, yaws, protozoology, and beriberi. Many of the abstracted papers are of great interest, and having them presented in such readable form, should prove a boon to all workers in Tropical medicine, and especially to those far removed from libraries. The *Bulletin* will soon prove itself to be the most useful of all the varied and numerous journals dealing with this interesting branch of medicine.

"Indian Medical Gazette," November, 1912.

Multiple Hydatid Infection of the Abdominal Viscera.—Major Steen, I.M.S., referring to the case of multiple hydatid infection reported in the *Indian Medical Gazette*, August, 1912, says that it brought to his mind a similar case met with at Gyantse, Tibet, in May, 1905. The patient was a Tibetan beggar boy, about 18—19 years of age. Four years previously he had noticed a swelling in the upper part of his abdomen, and this swelling had gradually enlarged. He was a very emaciated creature, almost moribund, with a huge distended abdomen, 39 in. in girth. On examination the abdominal cavity appeared to be packed full of tense cysts of various sizes. The larger cysts projected considerably, and gave the abdomen a very irregalar outline. Over one cyst, above and to the right of the umbilicus, a distinct thrill was obtained. Two prominent cysts were aspirated, and in the clear fluid evacuated hooklets and scolises were obtained. The boy died two days later.

At the autopsy about two pints of yellowish serum were found free in the general peritoneal cavity. The intestines, liver, spleen and numerous cysts were inextricably matted together by adhesions. The liver was enormously enlarged, and extended almost to the level of the umbilicus. It contained an enormous number of cysts varying in size from a child's head to a marble. Three or four only contained daughter and grand-daughter cysts.

The spleen was also very much enlarged, and proved to be simply a sac of cysts, large and small, of which only a few contained daughter cysts. Among the matted coils of intestine were numerous cysts of all sizes. One large tense cyst almost filled the pelvis.

There was a double hydrocele, but the fluid was not examined. The kidneys and lungs were not involved. The brain was not examined.

No effort was made to count the cysts, but there must have been several hundreds present. This is the only case of hydatids that Major Steen has met with in Tibet.

Notes and News.

THE SECOND ALL-INDIA SANITARY CONFERENCE AT MADRAS.

(*Continued from p.* 384, *December* 16, 1912.)

PAPER ON TOWN PLANNING.

MR. E. G. TURNER, Special Officer, Salsette Building Sites, Bandra, read a paper on "Town Planning," in one of the rooms of the Government Maternity Hospital, to which place the President and the members of the Conference drove from the Council Chamber after the conclusion of the President's address.

Mr. Turner illustrated his paper by exhibiting diagrams with the aid of lantern slides thrown on canvas.

The following is a *résumé* of Mr. Turner's paper on "Town Planning":—

The lines on which town-planning work is being considered in Bombay is really a combination of the English principle of "betterment" and the German principle of "redistribution."

Redistribution gives power to alter the shape of plots so as to render them more suitable for building plots. It is especially necessary in town planning in a country where buildings are mostly small and irregular in shape. The power to cut plots from larger holdings and allow them to owners dispossessed of their fields by the advent of roads and other public sites, allows the capital cost of the scheme to be reduced by the value of the plot allotted. The owner of the holding from which the allotted plot is carved will have his contribution for betterment reduced by the cash value of such allotted plot.

The power to redistribute will be held in reserve and used as much or as little as is found expedient. The wishes of holders should be followed as far as consistent with the objects of the scheme. Examples are given in the paper by diagrams of various alternative redistributions of plots.

Betterment enforces contributions from owners towards the cost of a scheme in proportion to the extent to which their land is bettered by the completed scheme. It is reasonable that holders should contribute some portion of their betterment towards constructional and other expenses, but no more should be taken than is necessary for actual expenses. The proportion to be taken should be limited as in England to one-half, and if any more is required it must be provided from other sources, general taxation, &c.

Credit and Debit.—By a method of credit and debit the amount of capital necessary to be raised is minimized. With each holder an account is opened, on the credit side of which will be the decrease in the value of his plot due to rearrangement, and on the debit side the portion of his betterment which is levied for expenses. The balance on the debit side will be levied from him, on the credit side paid to him. Instead of paying holders in cash for land they give up and afterwards levying a contribution from them, the difference of these two items will be levied from or paid to them, the amount of capital to be raised being materially diminished.

Betterment.—Method of calculating.

This may be done, as in England, after all the constructional works have been finished. Under a system of redistribution of plots there are advantages in estimating at the same time as the original and final plots allotted are valued, *i.e.*, before works are started. This allows of a set off being made in each account, and provides the local authority with an immediate security on which to raise loans. With a system of prevaluation power should be given to the majority of owners or to the local authority to demand a revised valuation after a fixed period.

Procedure.—(*a*) The local authority will publish a notification of intention to plan a certain area defined by boundaries and showing existing and proposed main roads.

(*b*) Owners will be fully consulted as to any redistribution that may be necessary and as to accommodation roads.

(*c*) A block plan and scheme will then be prepared showing details and objections invited.

(*d*) After consideration and alterations, the local authority will submit scheme and objections received to the controlling authority.

(*e*) The controlling authority will appoint an independent arbitrator, to be an expert valuer, who will draw up the final scheme and plan as sanctioned.

(*f*) He will award compensation payable for extinction of rights or any property injuriously affected, and will calculate the dues leviable from every holder in accordance with his valuations.

(*g*) The local authority will then notify the final scheme and date from which it will take effect.

Transfer of Rights.—So far as possible, the rights of lessees or mortgagees of original plots should be transferred in the same or a convenient modified form to new plots, and compensation paid to anyone injuriously affected. Agricultural lessees should not be transferred without consent of all parties. The arbitrator will decide questions of compensation for transference of rights, and decide what rights shall be transferred to the rearranged plots. On the day the scheme takes effect the old rights will be extinguished and the new rights take effect.

AFTERNOON'S PROCEEDINGS.

The afternoon session opened at 2.30 p.m. The chairman made a few remarks on the subject to be discussed, and called upon the Honourable Mr. J. P. Orr, C.S.I., I.C.S., to read his paper on "Light and Air in Bombay."

LIGHT AND AIR IN DWELLINGS.

The Honourable Mr. J. P. Orr, in the course of his paper, referred to the conditions at Bombay, details of which he gave. He thought it desirable that improvements should come from the people themselves, and spoke of the hopelessness of continuing methods of wholesale acquisition and demolition. The Trust, he said, had only touched 10 per cent. of the congested

areas, in spite of all their exertions. The remedy lay, he thought, in the provision of light and air by the application of 63½ degrees to every room in every house. The importance of this in a place like Bombay, where 85 per cent. of the population lived in one-room tenements, was enormous. The 63½ degree standard meant that there should be external air space outside each room open to the sky, extending to a distance measured horizontally from the room wall of at least half the height of the top of the opposite house above the floor of the room. The angle so prescribed would strike the floor at an angle of 63½ degrees. Partial remedies applied to isolated buildings were no advantage. The remedy must be applied universally to old buildings when rebuilt materially altered as well as to new buildings.

The first remedy was the direct prohibition of the use of any room for human habitation inadequately lighted and ventilated, and, secondly, the wiping out by degrees of all rooms of that description.

The result of wholesale acquisition and demolition was to drive out the population to other overcrowded quarters and to force up rents. When houses were rebuilt after such demolition the same class did not come back, but a superior class. Better to pull down parts of insanitary blocks—thus to render remainder more sanitary.

The effect of the proposals put forward in the lecture would be to dishouse 20 per cent. of the population, but there were ample empty spaces available for housing them.

The main lessons to be deduced from past experience and investigation were as follows :—

(1) Partial improvement was of no good. Some of those houses had been condemned as unfit for human habitation and rebuilt in accordance with existing municipal by-laws.

There was necessity for a standard to be fixed which must rigidly be adhered to. No reduction in the 63½ degree rate should be allowed at any rate in new houses, though a period of grace, say five years, might be allowed in old houses.

(2) Building operations must be controlled everywhere so that matters did not become worse.

(3) They must deal with rooms as a unit not with houses or blocks of houses.

(4) An absolute veto was necessary on the occupation of rooms which did not comply with the standard decided upon. After a period of say five years all such rooms should be closed.

(5) There must be removal of obstructive dwellings and consequent admission of light and air to surroundings. In that way the evils of overcrowding would also be reduced.

(6) Window area must bear some proportion, say 1 to 7, to the floor area. Otherwise it would lead to the evil of long deep rooms lighted by one window at the end.

In England the provisions for removing obstructive houses and demolishing houses unfit for human habitation, contained in the Housing of the Working Classes Act and Town Planning Act of 1909, had been widely applied at an extraordinarily cheap rate in Birmingham and other towns. The difficulty in India was that they were asking owners to go at once from a very low to a reasonably high standard; in England the previous standard was not so low.

In England there had nevertheless been violent opposition at first to the Act of 1909, but this was followed by a ready acquiescence. There was a good deal of public spirit in England where the citizens and the house owners realized what their duty to the nation and children was. The work in big cities was being done by public-spirited citizens, who qualified themselves for the work in every possible manner.

(*To be continued.*)

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

At a meeting of the Society of Tropical Medicine and Hygiene, held at 11, Chandos Street, Cavendish Square, W., on Friday, December 20, 1912, the following gentlemen were elected Fellows :—

Lieut.-Colonel Cecil Birt, M.R.C.S., R.A.M.C., War Office; Sir John Rose Bradford, K.C.M.G., M.D., London; Pedro G. Jgaravidez, M.D., Porto Rico; E. Hill Mayhew, M.B., St. Albans; Reginald A. Murphy, L.R.C.S.I., Assam; A. F. Wallace, M.B., Northern Rhodesia; Angus Wylie, M.B., Demerara.

The Report of Livingstone College for the year 1911-12 opens with a reference to the Centenary of the birth of David Livingstone, which will be celebrated on March 19, 1913, and points out that Livingstone College forms a memorial to the great missionary and explorer, which has been recognized by those best qualified to express an opinion, as worthy of the great man whose name the College bears. It is proposed in connection with the Centenary to raise a special fund in connection with Livingstone College, and an appeal is made for £10,000: £3,500 to be applied for clearing off the mortgage, £1,500 for various improvements, and £5,000 for the nucleus of an endowment. It is believed that many who desire to do honour to the name of Livingstone will be glad to co-operate in support of an institution which is open to missionaries of all denominations and all nationalities. 441 men have already passed through the College since the foundation of the College nineteen years ago.

The past two years have been specially difficult years attributed to the diminution in the number of missionaries going forth to the mission field, and this has led to an accumulated deficiency on the ordinary funds of the College of £700 at the end of the financial year.

A statement is given which was made by Sir Havelock Charles on Commemoration Day, 1912, at Livingstone College, in which he said that he questioned whether it was morally right for

societies to send out their men unprepared, when they could obtain knowledge which might preserve valuable lives.

The Report closes with an appeal for support for the College, and the statement that "in these enlightened days, with increased knowledge of Tropical diseases, it is a serious matter to send out any workers neither forearmed nor forewarned, and if this view prevailed there would be no difficulty in maintaining the College."

LONDON SCHOOL OF TROPICAL MEDICINE.

EXAMINATION RESULT (FORTIETH SESSION, OCTOBER TO DECEMBER, 1912).

Daukes, S. H., M.B., B.C., M.R.C.S., L.R.C.P., D.P.H.
Moore, A., M.D.Dub., D.P.H.
Beattie, J. A., M.D.Aber. (Colonial Service).
Condon, Major de V., I.M.S., M.D.Dub.
Footner, G. R., F.R.C.S., M.B.
Ismail, A., M.R.C.S., L.R.C.P.
Mayhew, E. H., M.B., B.C.Camb., M.R.C.S., L.R.C.P. (Colonial Service).
Browse, Major G., I.M.S., M.B., B.C.Camb., M.R.C.S., L.R.C.P.
Johnston, G. L., M.R.C.S., L.R.C.P.
Pawan, J. L., M.B., Ch.B.Edin. (Colonial Service).
Winter, W. C. P., M.R.C.S., L.R.C.P. (Colonial Service).
Sinha, A. K., M.B. (Calcutta).
Turton, R. S., M.R.C.S., L.R.C.P., D.P.H.Camb. (Colonial Service).
Marshall, C. H., M.R.C.S., L.R.C.P. (Colonial Service).
Dodson, G. E., M.R.C.S., L.R.C.P.
Bana, F. D., M.B., B.S. (Bombay).
Whitehead, F. E., M.R.C.S., L.R.C.P. (Colonial Service).
Swertz, H. C., M.B., B.Ch., B.A.O.R.U.I. (Colonial Service).
Rice, F., M.R.C.S., L.R.C.P. (Colonial Service).
Wallace, A. F., M.B., Ch.B.Aber.
Spurrell, H. G. F., M.B.Oxford.
Lamborn, W. A., M.R.C.S., L.R.C.P.
Dalrymple, J., L.R.C.P. and S.Edin.
Dunn, P. J., M.B., B.Ch., B.A.O.D.P.H.Dub.
Condy, E. M., M.B., R.U.I., D.P.H. Belfast (Colonial Service).
da Gama, A., L.M.S. (Bombay).
Rose, F. G., M.R.C.S., L.R.C.P., M.B., B.C.Camb.
Benson, J. M., M.B., Ch.B.Edin. (Colonial Service).
Hayes, H. W. McCauley, M.R.C.P.Edin., D.P.H.
Hoare, J. F., M.R.C.S., L.R.C.P. (Colonial Service).
Mason, C. W., M.D. (Nebraska).
Chakraborty, R. C., V.S.M., S.L.M. (India).
Murphy, R. A., L.R.C.S. and P. (Ireland).
McIntyre, E. T., L.R.C.P. and S.Edin. (Colonial Service).
Roberts, W. E., M.R.C.S., L.R.C.P. (Colonial Service).

Review.

A MANUAL OF INFECTIOUS DISEASES OCCURRING IN SCHOOLS. By H. G. Armstrong, M.R.C.S., L.S.A., and J. M. Fortescue-Brickdale, M.A., M.D.; with chapters on "Infectious Eye Diseases," by R. W. Doyne, M.A., F.R.C.S.; and "Ringworm," by H. Aldersmith, M.B., F.R.C.S. Bristol: John Wright and Sons, Ltd. London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd. 1912.

This little manual has been written for and is being issued by the Association of Preparatory Schools. As the authors state in their preface, the assemblage of large numbers of young persons under one roof leads to the introduction and ready spread of the infectious diseases to which they are specially liable, and such being the case the Association has felt that a manual setting forth the characteristics of each disease will be of assistance to the masters and mistresses of schools in dealing with them. Intended primarily for their use, the effort of the authors has been to give a clinical picture, as complete as possible, of the features of the various diseases; questions of pathology have only been lightly touched on and treatment has been dealt with only in a general way, the special treatment of each individual case being the province of the medical man in charge. Though written primarily for laymen, it is hoped, however, that the manual may also assist doctors in their school practices.

It has been found difficult to avoid altogether the use of medical and scientific terms, but these have, as far as possible, been placed in footnotes. A glossary has been appended of those employed in the text. More photographs and illustrations might with advantage have been incorporated in the text. Their teaching value is very great, especially when dealing with the laity. The book supplies a distinct want, and its contents should prove of use both to the laity and medical men generally.

Correspondence.

To the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

SIRS,—In the JOURNAL OF TROPICAL MEDICINE AND HYGIENE of November 15, Dr. Richard Arthur asks: "Can Anglo-Saxons colonize the Tropics?"

Among the first tropical parts to be colonized were the West Indies; and a careful study of these islands, and the condition of the inhabitants, supplies almost a complete answer to this question.

The island most worthy of study in this respect is Barbados. It is situated lat. 13° 4′ North, long. 59° 37′ West; it has an equable temperature, and a rainfall, on an average, of 57 in. The humidity of the atmosphere is lower than in the neighbouring

islands and this is of some importance. The island is of coral formation and very flat, and more than nine-tenths of it is under cultivation. There has generally been a keen struggle for existence among the inhabitants.

Barbados was colonized in 1625, and on the final defeat of Charles I and the advent of the Commonwealth a large number of members of noble English families were deported to or left for Barbados. Many of the direct descendants of these families are still flourishing in Barbados; for the most part they have kept themselves free from intermixture, with the possible exception of occasional fresh blood from England.

These families for more than two centuries have worked in the Tropics, and now in most British Crown Colonies there can be found white Barbadians holding high positions and leading keen active lives. It is true many of them have been sent to England for their education; but there are in the island many well-grown, upstanding men and women, of pure though distant European extraction, who have never seen temperate countries nor have their ancestors for generations. They are mentally and physically as well equipped as Europeans. These people are for the most part managers and overseers on estates; further, they are perfectly capable of considerable manual labour.

There are also a number of pure white people who must be considered to belong to the labouring classes, and were it not that they are harassed by such diseases as ankylostomiasis, would be almost capable of competing with coloured labourers.

If we turn to the other islands we shall find a number of white families of ancient tropical pedigree, who can still hold their heads high in the world, but the vast majority of these whites are degenerates.

These islands differ from Barbados in two points; in them malaria and intestinal parasites are rife, and there is very little struggle for existence in their luxurious climate; whereas in Barbados malaria is absent, intestinal parasites are fewer, and the struggle for existence is very keen, with the result that there is far less worshipping of Bacchus and Venus, and although alcoholism and venereal disease are far too common, they are much less rife than in most of the other islands.

Having considered the conditions of the inhabitants of the Tropics from the labourers upwards, I have come to the opinion that these parts of the world can support a race of people of white European extraction, who could successfully compete with the original stock, provided the first colonization is intelligently carried out by those who have a thorough scientific knowledge of the Tropics.

The hours of work must be properly regulated, proper amusements must be supplied, and sexual excesses are to be avoided. There must be complete sanitation; for malaria, intestinal parasites, venereal diseases and alcohol are practically the sole cause of failure, death and degeneracy. Without authority and knowledge there is no place in the Tropics for an Anglo-Saxon race.

The unique and happy condition of Barbados shows us that a good race of Anglo-Saxons can live in the Tropics, and there need be no degeneracy however far back in time may be their original ancestors.

The study of the Anglo-Saxon in the Tropics is a large one, but there is probably enough data for its practical application.

Yours truly,

LUCIUS NICHOLLS.

Fulbourn, near Cambridge,
December 7, 1912.

Personal Notes.

INDIA OFFICE.

From October 26 to November 23.

Arrivals Reported in London.—Major L. P. Stephen, I.M.S.; Major C. F. Weinman, I.M.S.; Captain H. R. Nutt, I.M.S.; Captain A. W. Stewart, I.M.S.; Captain A. H. Napier, I.M.S.; Major W. Lethbridge, I.M.S.; Captain R. D. Willcocks, I.M.S.; Major C. W. F. Melville, I.M.S.; Captain S. T. Crump, I.M.S.; Captain C. A. F. Hingston, I.M.S.

EXTENSIONS OF LEAVE.

Lieutenant-Colonel J. B. Jameson, I.M.S., 6 m. M.C.; Lieutenant-Colonel T. E. Dyson, I.M.S., 1 m.; Major H. J. K. Bamfield, I.M.S., 5 m.; Captain W. H. Riddell, I.M.S., 6 m. M.C.; Lieutenant-Colonel P. Strickland, I.M.S., 10 days; Lieutenant-Colonel J. B. Smith, I.M.S., 5 days; Major E. C. Macleod, I.M.S., 2 days; Captain G. I. Davys, I.M.S., 1 m. 1 day.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Crump, Captain S. T., I.M.S., 6 m., August 16, 1912.
Dick, Major M., I.M.S., Burma, 18 m. 8 d., August 5, 1912.
Hingston, Captain C. A. F., I.M.S., M., 6 m. 16 d., October 23, 1912.
Lethbridge, Major W., I.M.S., Rajpootana.
Nutt, Captain H. R., I.M.S., U.P., 12 m., September 19, 1912.
Weinman, Major C. F., I.M.S., B., 13 m. 14 d., October 3, 1912.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Corkery, Colonel W. A., I.M.S., P.M.O., 3rd Lahore Div.
Fraser, Captain F. C., I.M.S., to November 24, 1912.
Graves, Lieutenant-Colonel, D. H., I.M.S.
Napier, Captain A. H., I.M.S., to April 15, 1913.
Stephen, Major L. P., I.M.S.
Stewart, Captain A. D., I.M.S.
Willcocks, Captain R. D., I.M.S.

Notices to Correspondents.

1.—**Manuscripts sent in cannot be returned.**

2.—**As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.**

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communication.

DISEASE IN MADAGASCAR.

By C. J. A. MOSS, M.D.
Medical Mission, Tananarivo.

THE Island of Madagascar is a very large island situated in the Southern Hemisphere, extending from lat. 11°57′ to lat. 25°38′ S.; all but a small portion in the extreme south is therefore within the Tropics. Its length is roughly 1,000 miles, its greatest breadth 350, and its area 250,000 square miles. Its main physical features are as follows: A section from east to west at about the latitude of the capital, Antananarivo, would show, first a belt of lagoons, then gradually rising ground, extending to about thirty miles inland, with old sea beaches at varying levels, then a chain of mountains rapidly rising to about 4,000 ft. high, the slopes of which are covered with thick forest and impenetrable jungle. Following that is a plain some twenty-five miles broad at a somewhat lower level, on the western boundary of which is another mountain range of less altitude than the former, and again forest clad; this is the watershed of the country. To the west of this an altitude of about 5,000 ft. is attained, and in this elevated area is the Central Province of Imerina. A succession of undulating hills rising from this central plateau eventually leads to a desert region on the west, the extreme limit of which is a sudden drop of some 2,000 ft. into a well-watered district with small isolated areas of forest. Finally, after traversing another mountainous belt of lower level the dead level is reached, and one arrives at the Mozambique Channel.

The features noted in this cross-section can be traced with fair accuracy through the whole country from north to south. The forest area, known as the Great Forest, to distinguish it from the lesser belt, extends for about 800 miles, and attains a breadth of about thirty. In the south-west of Imerina there is a large mountainous mass known as Ankaratra, which attains a height of nearly 9,000 ft., many of the peaks being volcanic. There is one higher mountain near the north end of the island.

The central plateau is characterized by its bare hills and relative absence of verdure. The valleys are largely under cultivation, being devoted to the culture of rice, the staple food of the native population. The capital itself, Antananarivo, stands on a long hill some 400 or 500 ft. above the plateau; and to the west of it, for a length of about thirteen miles, there is one continuous rice field on either side of one of the numerous rivers which course through the province on their way to the Mozambique Channel. Connected with this rice field there is an important health problem, which will be alluded to later. The capital and the larger villages in its vicinity demand some modification of the term bare, for of recent years the Cape lilac, Norfolk Island pine, and eucalyptus have been planted in abundance, but such luxuriance is the exception in Imerina and not the rule.

The climatic conditions naturally vary very much in this huge island. The most important points to note are the general humidity of the forest belt and the low-lying region on the east of the island, the more uncompromising heat of the low-lying country on the west and the more temperate character of the climate in the elevated central province, where our heat is tempered for so many months of the year by the refreshing S.E. wind, and where the division of the year into wet and dry seasons is so clearly marked. Judging by statistics collected several years ago in Antananarivo, the average rainfall during a term of fifteen years was 53.94 in., of which very little fell from May to September; the mean temperature during nine years was 62.04, the highest reading in the shade being 83° F., and the lowest 46° F., of which it should be remarked that the situation was sheltered, as a temperature of 32°, or nearly approaching it, occurs during the winter in the central mountains. On the N.W. coast the rain during one year was 53.37 in., the highest reading of the thermometer being 96.5°, and the lowest 62°, but it must be noted that the highest readings in any month never fell below 86.2°; the solar temperature was registered, and was between 151.9° and 177.4°.

On the S.E. coast observations were taken which showed an annual rainfall of 121.96 in., with a monthly fall of from ½ to 18 in.; a maximum shade temperature of 90.9°, a minimum of 43.4°; and a solar temperature between 120.9° and 149.3°. Readings at Samatave have shown a rainfall of 95 in.

It is twenty years since Dr. Andrew Davidson, the founder of the Medical Mission in Madagascar, discussed the diseases prevalent in Madagascar in his work on Geographical Pathology. I am unaware of anything more modern than that having been written in the English language and covering the same ground. Unfortunately, I have not at hand any study of the subject from French sources, and I have not succeeded in finding such a thing here. It will be useful before considering the health of Europeans to study briefly the diseases prevalent among the natives. Further scientific research is needed to elucidate many problems connected with the subject, and that research awaits the pathologist and the bacteriologist more than the clinician; French scientists are engaged in investigating these questions.

Malaria.—As far as observation goes, malaria would seem to be endemic practically all over the island. A rapid mental survey of the chief provinces at once reveals the fact that malaria is prevalent in each. The extreme south of the island may possibly prove an exception, but of this I am very doubtful. A province known as the Bara, about 250 miles from the southern extremity, was considered so highly malarious in the days of the Malagasy Government that men of inconvenient

eminence were sent there as Governors to be out of the way of possible competition! That district also was, and still is, very fatal to the Norwegian missionaries working there. Still farther north is the province of Betsiles, of which some districts have an unenviable notoriety on account of malaria, and throughout which from time to time there are epidemics of a malarial character of rampant severity.

Then we arrive at the province of Imerina, of which the same must be said, and starting again from there, whether one considers the route to the coast due east, or north-west, *viâ* the lake province of Antsihanaka, a hotbed of fever, or north-west, *viâ* Vonizongo to Majunga, the same holds good. Neither must exception be made in the west in favour of the district occupied by the nomadic Sakalava tribe, for there, too, malaria abounds.

The type as seen in Antananarivo and Imerina is chiefly quotidian and tertian; it is very prone to relapse after about a fortnight, and is followed by much anæmia and sometimes an extreme enlargement of the spleen, the whole abdomen, as far as the right ileum, being occupied by that organ. There is a very marked difference now in the incidence of malaria compared with that of the days of the Malagasy Government. At that time there were certain notoriously unhealthy villages and districts, often but not exclusively in the neighbourhood of marshes. People hailing from these places were brought from time to time to the capital for treatment, but the inhabitants of the capital itself were free from malaria, unless they happened to contract it while away. Now, every year, from February till June or July, malaria is a terrible scourge, tens of thousands being laid low in the capital and surrounding country. One cannot say whether anopheles was or was not to be found in those former days, but now there are swarms of that mosquito.

The explanation, which I believe to be satisfactory and trustworthy, is two-fold. It was a custom of the Malagasy to burn the long grass over the hillsides and by the rivers and streams so as to produce a better crop for their cattle. During the rebellion, which immediately succeeded the French occupation, beacon fires were used largely by the rebels as signals, and the French Government took the not unnatural step of forbidding the burning of grass. Probably the destruction of grass had rid the neighbourhood of countless mosquitoes, so that the decree had the unexpected effect of allowing a great increase in the number of mosquitoes.

Secondly, in the early days of their occupation the French Government instituted a system of general taxation by means of a poll-tax. Those unable to pay were drafted off to Government service in lieu of their tax. The greater part of the male population of the district round the capital were unable to pay. The Government were interesting themselves at that time in the construction of good roads to connect the capital with important ports. To this work the men from the villages in Imerina were sent. Many of the districts in which the work was carried on were notoriously malarial. The consequence was, that very shortly there was a high mortality from malaria among the newcomers, and many were incapacitated for work, and so were sent back to their villages. After their return to their homes there was a pandemic of malaria all over the province. It is possible that the lack of men to work round the villages was a contributory cause to the presence of rank grass and undergrowth, which would harbour more mosquitoes than usual, but the stopping of the burning seems to me to be the more probable one. The death-rate from malaria ever since has been exceedingly high.

It is interesting to notice a change going on in the healthiness or otherwise of certain villages, the unhealthy ones sometimes losing their malaria, and the healthy ones becoming infected for no obvious reason.

As a general rule the most unhealthy areas tend to gradually lose the virulence of their malaria after three or four years, and in time become more habitable; immunity might effect this, but would not protect newcomers, and newcomers do seem to escape infection.

Since the extreme frequency of malaria, a disease which formerly lurked only in the most unhealthy regions has made its presence in Imerina and claimed many victims. I refer to blackwater fever. My personal experience of this disease is very limited, but one has no difficulty in dividing the cases into two types, one where, apart from the hæmoglobinuria, the patient seems almost well, and where, I believe, he invariably does get well; the other, where the alteration in the blood is extreme, the symptoms very severe, and a fatal issue seems almost inevitable. I believe this disease was first described to the world at Nosibe, an island off the N.W. coast, which has been for long under French occupation; in the old days it was restricted to such regions, now it may occur anywhere.

To allude briefly to a few of the more common general diseases before passing to those of the various systems.

Infective Fevers.—Scarlatina appears not to exist; I have seen one or two cases which I should have unhesitatingly diagnosed as that disease in Europe, but as they never infected others, I am not able to contradict the received opinion. Measles occurs in severe but infrequent epidemics; I believe the last two epidemics have been at nine years' intervals. The consequence of this is that almost all the children under that age contract the disease simultaneously, a great strain is imposed on the friends who nurse the sufferers, and lack of care leads to many contracting respiratory troubles, which often prove fatal. Small-pox has been nearly exterminated since vaccination became general; formerly it was of great frequency.

Enteric fever is not very frequently met with, and never now assumes epidemic proportions, but in the years 1892-93 it was exceedingly rife, more than

a tenth of our whole in-patients being sufferers therefrom, *i.e.*, about a hundred per annum. It had greatly diminished in frequency before the French occupation.

Typhus does not exist. Cholera is not known. Plague has visited some of the principal ports, but has been promptly and most successfully restricted in area and wiped out. So far as I know, there is no ankylostomiasis, bilharziasis, kala-azar, sleeping sickness, nor yellow fever. Beri-beri has occurred on the coast, and I believe I have seen it in Imerina.

Pertussis appears nearly every year. Diphtheria we meet with occasionally. Influenza arrived among us in 1890, and has been a scourge ever since. We are never really free of it in sporadic form, and occasionally have pandemics, somewhat allied in form to malaria, but without periodicity.

Among other general diseases we may notice leprosy, which is far from rare. Patients are segregated, and the opportunity is taken to use certain methods of treatment, of which I believe that by Chaulmoogra oil, and more recently the Nastin treatment, have had some successes. I myself have been pleased from time to time with the results of the former; the latter I have not had the opportunity of using, but my patients from leprosy are very few.

The theory that connects the consumption of dried fish with leprosy does not seem to fulfil the necessary conditions, as one would expect the disease to be extremely widespread if such a universal habit were the cause. On the other hand, I do not think the bed-bug is of sufficiently common occurrence as to be the cause; I have very rarely seen that insect, though fleas and lice are ubiquitous and multitudinous.

Elephantiasis is rare in Imerina; I have seen it fairly frequently attacking the vulva, only in very few cases the legs, and never in my experience the scrotum. On the east coast it is fairly common. I understand, however, that observations made at the French Hospital go to show a very high incidence of filaria in the general population; if I remember right, about 70 per cent. of all persons examined showed filaria. I have not had any chance of verifying this observation.

Syphilis in the form of condylomata in young infants, and secondary and tertiary manifestations is of almost universal prevalence. A primary sore, however, is almost unheard of. I have never seen a Hunterian chancre all the time I have been in the island. Soft sores one sees occasionally.

Gonorrhœa is exceedingly common.

Cancer is fairly common, chiefly of the breast and cervix uteri.

To turn for a few moments to Systemic Diseases.

Circulatory System.—Valvular disease is common among the natives, probably due to strain and hard conditions of life, and not to acute rheumatism, which I believe does not exist in the island.

Muscular Degenerations are also fairly commonly found. *Aneurism*, in spite of the prevalence of syphilis, appears to be rare.

Respiratory System.—Pneumonia is exceedingly common, often in epidemic form, the severity of the epidemics varying, from very severe to ordinary types.

Bronchial complaints are fairly common.

Tuberculosis is, unfortunately, very common, and there is a great need of efficient measures for institutional treatment, as it is nearly impossible to adequately treat the patients in their homes.

Alimentary System.—Dyspepsia bulks largely in our out-patient cliniques, probably owing to the habit of taking two meals only during the day, when a large quantity of rice is rapidly consumed. Organic disease of the stomach is rare.

Parasites are extremely common, specially among children, where a dose of santoin is almost invariably efficacious.

Tænia is fairly frequently met with, and there are parasites special to the island, *e.g.*, *T. Madagascariensis*.

Dysentery is not uncommon, specially on the coast. Of recent years I have seen several cases of severe syphilitic disease of the rectum with stricture.

Appendicitis is rare among the natives.

Skin Diseases are extremely frequent, especially eczema, impetigo, scabies, and secondary syphilitic manifestations.

Urinary System.—Bright's Disease is not common. Calculus is frequent.

Lymphatic System.—Tuberculous glands are common. Enlarged spleens are very common, and generally put down to malaria, but possibly further study, with examination of the blood, would place some of these cases in other categories.

Nervous System.—Diseases of this system are rare. Acute poliomyelitis, paralysis agitans, facial paralysis, are occasionally met with, epilepsy and hemiplegia perhaps more commonly. Locomotor ataxia and general paralysis I believe I have seen, but they are, in spite of the frequency of syphilis, very rare. Mental disease is rare; more adequate provision is now made for such cases in a special hospital. Chorea we occasionally see.

Of diseases of the special senses, perhaps disorganization of the eye from injury by the husk of the rice grain flying up during pounding and hitting the cornea is specially noticeable; ophthalmia neonatorum is common; otorrhœa is common, occasionally proceeding to serious disorganization of the ear.

Reproductive System.—Disease of this system in the female is of extreme frequency, and actually provides me with at least a quarter of my patients. Though cases of gonorrhœal peritonitis are seldom seen, or perhaps I should say seldom diagnosed; the results in the form of retroverted uterus, fixed by adhesions with cystic tubes, and often cystic ovaries, are very common, and apparently out of all proportion to the initial peritonitis. Disturbances of menstruation are also very common.

New growths, such as fibroid, parovarian cysts (perhaps more frequently than ovarian), and

carcinoma are common. We very often meet with extra-uterine pregnancy.

Diseases of Bones and Joints.—Syphilitic periostitis of the long bones should be alluded to. Rheumatic affections are frequent, and possibly may be connected up with forms of purulent discharge, whether from pyorrhœa or gonorrhœa, which are also common. Tuberculosis of the joints I find very rare.

I have now to pass to a consideration of my European patients. I feel at a disadvantage in studying such a subject, as I have no records with me, but I have been able to find full lists of missionaries, and memory has enabled me to recall with some fulness the medical history of those families whom I have treated. There is undoubtedly a lack of absolute accuracy in my figures, but the error, I think, cannot be very great. My review is practically a health record of the missionaries of the L.M.S. and F.F.M.A. for fifty years. I have from time to time seen members of the other missions, the S.P.G., Norwegian and French Missions, as well as traders and others, but I have not been the regular medical attendant for all these, and therefore will leave them out of my detailed consideration. I have made a record of 215 adult missionaries and 459 individuals, including children.

To consider first the health of these 215 adults. I naturally have no intimate knowledge of the health of those who had left the island before my arrival there in 1889, but many of the early missionaries were still in service at that time, and to some extent their medical history remains in my memory. Though not exclusively so, most of these patients have been resident in the Central Province of Imerina. The incidence of disease amongst these individuals is not of great importance for our present purpose, apart from what may be attributed to tropical, or at least, local influences. We will consider first malaria. Of the 215 adults, I am quite certain that sixty-five have suffered more or less from malaria, and of the rest it is quite safe to say that a fair number have suffered. A difficulty that confronts one is that people are now so conversant with the treatment that they do not send for a doctor unless the symptoms are unusually severe or the disease unusually obstinate. Five deaths have occurred from this cause, five deaths in at least sixty-one cases; one of these was due to sudden collapse, and the patient was, I believe, found dead in bed, so that the actual circumstances cannot be detailed. Another was a day's journey from a doctor, and death may have been due to the effects of a fall which occurred during fever. Of those who have prematurely retired from active service there may have been two incapacitated by malaria. It is clear that in certain provinces practically all the missionaries suffer from malaria —those are Antsichanaka, Betsileo, the Coast, and Vonizongo. The attacks of malaria have varied much in severity and obstinacy, but no cases presenting extraordinary symptoms remain in my memory. Vomiting, headache, achings in the limbs, restlessness and sleeplessness are the chief features. What is of more interest perhaps is that very few Europeans retain spleens appreciably enlarged, and even sufferers from prolonged and frequent malaria do not present that organ perceptibly enlarged. The most lasting effects appear to fall upon the nervous system, as obstinate cases of neuralgia, often of a periodic type, cases of neurasthenia, and cases of persistent latent malaria, where an attack of fever is simulated, but without rise of temperature or pulse-rate, are sometimes seen.

The treatment adopted has been by quinine, in different forms and modes. Early on I believe very large doses were adopted—30 to 60 gr. at a time—by mouth or by rectum. Some of the early missionaries became prematurely deaf, but perhaps only five out of our sixty-five were seriously affected. Later, the dosage was diminished, and now I find a practical difficulty in getting a patient to take more than 15 to 20 gr. a day, 5 gr. being considered a large dose, and the stomach frequently objecting strongly to even that, though I often prescribe an acid with the quinine. Of late years, however, we have frequently given quinine by intramuscular injection, of which one must say that, given with due aseptic precautions, there seems to be much advantage; as a smaller dosage is employed, the results are far more sure and the stomach is not outraged. There is, however, the disconcerting fact that now and again a case of tetanus supervenes. I believe this has been of frequent occurrence on the coast. I have only seen one case in a native, on whom the injection was not given by myself, but by my assistant, who, however, always relieves me of this work, and who gave several other injections at that very time. A later case of death from tetanus after malaria and injection—not in my practice—leads me to think probably the injection was responsible in that case, too. I have seen recently that the presence of the bacillus of tetanus anywhere in the system, quite apart from the point of injection, is sufficient to cause the appearance of that disease at the seat of injection.

There is no doubt that this mishap is exceedingly rare, but that it is a possibility makes one hesitate to employ injection in what appear the simpler cases, where quinine is well stood by the mouth, and to reserve it for the more obstinate and more irritable cases, and for such serious manifestations as coma and pernicious malaria.

Blackwater Fever.—I am thankful to say that I have so far not had any missionary patients with this disease in Madagascar. One patient, however, a missionary of thirty-five years' standing, after suffering much from malaria during his last year in the Island, developed hæmoglobinuria three months after arriving in England, that being his first attack. The attack was not very severe so far as it went and it readily passed off, and the patient got up his strength fairly well. There had been, however, dangerous cardiac debility during the illness, and after about a couple of months' convalescence, when

slight attacks of malaria had again supervened, sudden death took place, probably from interference with the heart's action by gaseous distension of the stomach.

I should like next to say a few words about typhoid fever. This disease has of recent years been comparatively infrequent, but during a severe epidemic in 1892-3 (already referred to) several Europeans were attacked. I have collected seventeen cases of typhoid, including children, from among our two missions, and I recollect seven other cases outside.

Of these seventeen cases, three were fatal. One of these occurred many years ago in very difficult circumstances, and I do not know if there was any medical attendance; there was the complication of miscarriage, and the illness commenced during a long journey. The other two cases were of more recent date. One was a patient of mine, and got quite over her typhoid in spite of her age, which was 65, but convalescence was unsatisfactory, and after lingering about ten weeks she finally succumbed to hypostatic pneumonia. The other was a young man living some five hours away from the capital, who was supposed to be suffering from malaria, and who was not professionally treated until he was very seriously ill; he had seriously overworked, and was unable to stand the strain. I was not in the island at the time, but from what I have heard I should gather that there was perforation. With these exceptions our cases have been fairly straightforward; I should only regard one of them as being very severe, and that was the first. One was followed by phlebitis, and did not regain her strength until after her furlough. Otherwise the convalescence has been normal, and by due regard to the question of change of air and prolonged rest, our patients have recovered well.

The other seven cases that I referred to were in members of other missions or else of the general community. Of these, three died, one from perforation, one complicated by a large fibroid, and one, that I did not see, from asthenia. One of the others had an ordinary attack, but remained semi-delirious for a considerable time.

Of recent years the cases have been sporadic, one appearing every two or three years. It will be interesting to see how far protective vaccines are successful in preventing the disease. I think four out of the seventeen cases occurred during the first year after return to the island.

I will now pass on to diseases of the various systems.

Circulatory.—I must here state that of the 215 adults I do not think I can have had the opportunity of examining more than eighty-five, and it is probable that of that number I have not examined quite all.

Of these there seem to be twelve with cardiac affections, and they seem divisible into two classes, valvular and degenerative. Of the valvular cases we have had four, at least, who have been able to work fairly well for a considerable number of years, two certainly for over twenty years. These patients have had to be taken rather special care of, but that it has been possible to have them with us at all is satisfactory. One of the four was unable to stand the altitude, and after two or three marvellous recoveries from very severe want of compensation, she had to leave the island. A second is not robust, but does not suffer much from actual cardiac symptoms, and is able to do an admirable amount of work. The same may be said of the third. The fourth suffered from time to time from exacerbations of valvular mischief, but she lived an exceedingly active life and was, I believe, 60 before she died.

The class of degenerative heart cases includes chiefly those who have been a long time in the island, twenty-five years or more; a few have developed heart disease as a result of severe malarial fever. Three such cases are prominent in my mind, but it is possible that several others ought to be added from our retired lists. Of these three, one has been wisely kept in England, one returned to Madagascar on his own initiative, and I thought right to promptly advise his return to England, a third recovered his tone fairly well, but proved unequal to the strain of work and succumbed out in Madagascar. There have been other cases presenting arterial degeneration and a so-called weak heart.

Respiratory System.—I remember four cases of asthma, who seem to have suffered much more in the high inland regions than at a lower level; two, at least, were wonderfully well on the coast. All remained many years in the island.

Tuberculosis.—I can pick out three cases of early tuberculosis and four more advanced. The three early cases recovered either absolutely or nearly so, one on the field, the other two improved vastly in the island, and were cured during furlough.

Three cases have died, one a lady who seems to have developed the disease almost as soon as she arrived in the island, and who only lived seven months. Another case, also, I believe, of tuberculosis, died during his first year. The other lived thirteen years in the island and got a very serious exacerbation, but eventually died in this country.

Alimentary System.—Diseases of this system present us with a large number of cases, especially in the form of gastro-intestinal complaints in children. Probably a bacteriological examination of such cases would be of great value, and this could probably be undertaken at our Pasteur Institute in the capital. A good many infants have lost their lives from gastro-enteritis, several in earlier years, of whom I have no knowledge. I can recollect four in my time, of whom one I did not see, the illness of another in the country was more or less of a mystery; a third succumbed to a second attack of entero-colitis, and a fourth to malnutrition.

Amongst adults I do not think we have an undue amount of liver disease; there are several cases of congestion of that organ, and one, I believe,

of cancer. A good many suffer more or less from hæmorrhoids, and three or four have required operation. Chronic constipation is a great trouble to a few patients. I met with one case of sprue, which is not a disease of which I have otherwise any experience. Dysentery is fairly frequent, but in most cases is well amenable to treatment. It does, however, occasionally remain chronic, often not at all severe but obstinate. A case of this kind, in which there must have been slight peritonitis resulting in painful adhesions, was much relieved, if not cured, by vaccine treatment in England. There have been four cases of appendicitis, two not operated on, one operated on too late, and a fourth, in the country, who was not seen by me, but who died, evidently from internal rupture of a large appendicular abscess.

Of diseases of the skin and of the urinary and hæmopoietic systems it is not necessary to say anything, as they are in no wise of more than ordinary incidence.

Reproductive System.—Many ladies suffer from functional derangements and menstruation, menorrhagia, dysmenorrhœa, and sometimes amenorrhœa, but these do not appear to be of great severity, though they certainly militate against good health.

Nervous System.—Neurasthenia is by far the most frequent affection to which our adult missionaries are subject. In some it has been sufficiently severe to demand their being sent away on furlough as early as possible; in others they were not sent as soon as I ought to have sent them.

The cause of this tendency, which I believe is of much greater incidence of recent years, seems to me to be partly overwork and partly anxiety. There is no doubt at all but that several of our missionaries are working at very high pressure; this is a source of constant anxiety to myself, and involves a good deal of study of their work in order to try to regulate their duties and see where strain can be best relieved. There are always some who are overworked and who seem to invariably have the share of two ordinary mortals. I can see no other way of meeting these cases but by constant watchfulness, but one is not always aware of what is occurring in every household, and one is sometimes consulted too late to prevent a serious breakdown. The possibility of sending such patients away to a sanatorium is a very great boon indeed, but the question of suitable companionship is a difficulty, as one wishes, as far as possible, to limit the interference with mission work to that department in which the patient is engaged. The lack of daily exercise and the influence of bright light have probably something to do with this tendency to neurasthenia.

Confinements.—There is not much in the study of the confinement cases that I have attended that is of special interest from the point of view of the part of the world in which they have occurred. Out of thirty-nine ladies attended, of these cases I have statistics, there were abnormal circumstances in seventeen, a distinctly high percentage; seven had inertia and forceps delivery; there were three breech cases, one being stillborn, two footling, one forehead, one placenta prævia, the child being stillborn, and three adherent placenta. In twenty-nine confinements of other European ladies there were seven abnormalities; one had post-partum hæmorrhage on two successive confinements, and one case died from sepsis, which appeared on subsequent investigation to have been due to the attentions of a native servant, the subject of a purulent discharge and erysipelas. In our total list of European confinements of earlier date there must be noticed three deaths from septicæmia, one missionary losing two wives in succession from that cause, the same bed, I believe, having been used on each occasion. A death was recorded also, I believe, from cellulitis in an asthenic subject. There was one case of puerperal mania, which recovered.

It may be of use to examine cursorily the causes of death amongst missionaries; several have been already alluded to.

Of the older missionaries, who died either in the island or immediately on arrival in England, there were twelve. There were four deaths from malaria, one from tuberculosis, one from mitral disease, one from cancer, one from typhoid fever, one probably from liver abscess, one from appendicitis, and two from causes unknown to me. Two of our senior missionaries met with a violent death at the hands of the rebels soon after the French occupation. Thirteen of the younger missionaries have been cut off, three dying from septicæmia, one from cellulitis, two from typhoid, one from appendicitis, one from dysentery, two from tuberculosis, probably two from malaria, and one from a cause unknown to me.

Of thirty missionaries who have been invalided home, or who have retired prematurely, seven were seniors who had anticipated further service; the causes of their retirement were anæmia, neurasthenia, asthma, hypertrophied heart, mitral disease, cardiac irregularity, and malaria. Two of these have died. The causes of retirement of twelve younger missionaries have been mitral disease, cardiac weakness, two each of nerve failure and delicacy, one each pelvic disease with extra-uterine pregnancy, mental weakness, tuberculosis, three probably of malaria. Eleven retired on other grounds.

An inquiry into the state of health of the children on the mission field is not feasible, as it is impossible to collect statistics of the children of earlier missionaries and the exact number of them cannot now be told, but in my figures of 459 individuals, I included 243 children of whose existence I am certain, but I am equally certain that the figures are a good deal below the mark. Among these children I know that twenty-nine died in Madagascar from such causes as convulsions, two cases; broncho-pneumonia, one; three stillbirths; five from forms of diarrhœa; one from malaria; and one who was, I believe, imbecile; fifteen died from causes of which I do not know.

In conclusion, I should like to briefly allude to some problems of interest in connection with the health of our missionaries and, perhaps, the health problem generally. Perhaps the statements that I have made may strike others in a different way to that in which they strike me, but a consideration of the question of the incidence of disease in the Central Provinces leads me to the conclusion that that field is not remarkable in any way. There has not been a very high death-rate, either among adults or children; there has not been a high percentage of retirements; there is not a very large amount of sickness. What is, perhaps, more evident, is that many are never very strong and are frequently ailing. I believe this to be due often to slight constitutional errors and to physiological sins, which it is not always easy to discover. Especially is this the case where the medical man has not the facilities necessary for research. Minute investigations, especially, say, with regard to the alimentary tract, both of what enters and what leaves the system, are uncommonly difficult, in fact, seem to me impossible to carry out. And yet, to my mind, the state of health very frequently depends on some minute change. I think more may now be done in Madagascar in the way of chemical and bacteriological examinations if we can make use of the well-appointed Pasteur Institute for that purpose, and that may help us to realize just the point against which treatment must be directed.

But it is also just in regard to this matter that I consider the careful observations made to the societies' medical advisers during furloughs likely to be of value. By examination, and if necessary by the consultation of specialists, pathological causes and tendencies can be detected.

A problem to which allusion must be further made is that of malaria. I mentioned that Antananarivo stands on a hill, with a large rice plain to the west of it. This plain exercises a most injurious influence on the health of the community, as is evidenced by the fact that the inhabitants of the villages by the sides of the plain are the first, and perhaps relatively, the greatest sufferers from malaria. Were it not that the whole population of the district is dependent on that valley for their food supply, there would be no complexity about the problem of malaria. But as it is, the question arises how the natives are to retain their rice and lose their mosquitoes. The importance of mosquito brigades has not, I think, been grasped by the authorities, but I feel that benefit would accrue from an attempt on those lines. There is from time to time an outcry against undergrowth, and this is quite correctly cut down. Lately, I believe, the Cape lilac has been looked askance at as a harbourer of mosquitoes, and the increased numbers of this insect been linked up to the increase of those trees. But my own observations would lead me to think that the increase of trees preceded the fever by a good many years, and I think other steps than the cutting down of the Cape lilac are necessary. The Government are assiduous in their distribution of quinine, and, I hear, are trying to persuade the natives to use mosquito netting. I fear that the use of netting is not adapted, either to the customs or the genius of the people, with their comparatively rough houses, ill-fitting roofs, open doors, lack of attention to small details, and absence of bedsteads. I fail to see how they can adopt mosquito netting, and even if they did the Government would have to institute a new *rôle* of house inspector to see that the netting is not subject to more than its usual solution of continuity. Could petroleum be employed without ruining the growing crop? If not, would it not be worth the Government's while to spend a large sum in importing rice for a year, so that the rice fields could be fallow, suitable culicicides be employed, and the people, deprived of their home-grown rice, be helped from headquarters in what would be to them a terrible hardship?

I am unaware if this difficulty has been overcome on a large scale in other parts of the world, but I feel that, without question, its solution is urgently demanded for the eradication of malaria and the release of the whole community from their greatest menace. I am painfully conscious of the great defects of this paper, but, such as it is, present it to the indulgent consideration of the Association of Medical Officers.

Verruga peruviana.—Cole, in the *Archives of Internal Medicine*, vol. 10, No. 6, December 15, 1912, describes a comparative study of verruga peruviana in man and the ape. As regards the diagnosis of the condition he says that one must always keep malaria in mind, the two diseases having been very frequently confused, but the blood-picture will serve to differentiate them. In a patient having the cutaneous tumours as the predominant symptom it would also be necessary to think of neurofibromatosis (von Recklinghausen's disease). The affection occurring in a tropical country, frambœsia and *Bouton d'Orient* would likewise have to be considered in a differential diagnosis. In the former, suitable examination for the specific spirochæte would be sufficient, while in the latter there would be the history of painless ulcers on the exposed parts, in which proper examination would reveal the Leishman-Donovan bodies.

Finally the author reaches the following conclusions:—

(1) In a case of Verruga peruviana, *Eruption de Carrion*, there was success in inoculating the disease into apes to the third generation, further transmissions being hindered only from want of material.

(2) The lesions from the man and the apes resembled each other very closely histologically, were granulomatous in type and had peculiar lymph-vessel inclusion areas.

(3) None of the organisms mentioned as specific for the disease were found either in the lesions from the patient or from the animals.

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ATHLETICS AND CANDIDATES FOR SERVICE ABROAD.

THE medical examiner of young men for service abroad is often placed in a difficulty by finding that the heart, the kidneys, the digestion, and at times the lungs are affected more or less seriously by unwise indulgence in athletic exercises. Of these organs the heart is primarily affected, and secondary to the condition of the heart some one of the other organs are affected. School sports may, or may not, leave their stamp on the physical condition; the age at which most young men leave school to follow a commercial pursuit is about 17, and except occasionally no marked damage is done before that age. The lads compete in their sports with others about the same age as themselves, and the strenuous endeavour to succeed is less evident at this stage of their career than when they leave school and enter into competition with men older than themselves. Besides, given average healthy organs, the effect of severe muscular effort on the condition of the heart and blood-vessels, up to 17, usually passes off fairly quickly, for these organs can accommodate themselves more readily to circumstances, and can recover their equilibrium as a rule without leaving deleterious consequences. After school life is over, when the young man joins a firm as clerk, lives in lodgings, and has his Saturday afternoons only for athletics, the period of danger begins. Cooped up in an office for many hours, meals of the type calculated to engender dyspepsia—the hurried breakfast, lunch whilst standing at a bar, an office tea, a lodging-house supper—little or no exercise during the week, and then an athletic outburst on Saturday afternoons represents the life of a young city clerk at the present day, or of a young accountant wishing to go abroad. The Saturday afternoon exercise is taken at the end of a week of indoor life with unwholesome surroundings; the heart is suddenly called upon to respond to sprinting, long distance running, football, hockey, rowing, long distance cycling (Saturday and Sunday), or some one of the many forms of athletics in vogue. The muscular tissue of the heart increases in bulk for the time being, but for the remainder of the week lies fallow; week after week the process is repeated; hypertrophy and wasting alternate, and as the years pass the effects disclose themselves. It is the young man as above described that as a rule comes up for examination as to his fitness to proceed abroad to a tropical climate, and the medical examiner has to make up his mind on the matter. The writer, after considerable experience in such matters, is of opinion that only 20 per cent. of the young men coming up for examination are thoroughly sound physically, and if we were to eliminate all those who have one or two drawbacks, rejection of candidates would be the rule. The commonest ailment is dyspepsia, as gathered by the dilated state of the stomach and the stomach "splash" that can be so frequently elicited. The candidate always denies all knowledge of dyspepsia, even when the stomach occupies the upper part of the abdomen as low as the umbilicus, and when splashing reaches from below the left ribs to the right hypochondrium. A stomach like a bucket of water is a common state with the city clerk, and he believes that the feelings to which he is accustomed is the normal condition of man. Can the medical man recommend a candidate in such a state for service abroad? The answer is "Yes" and "No." The condition of the stomach is due to irregular and unwholesome diet, to want of exercise, &c.; a condition brought about by his meagre pay, his lodging environment, and the impossibility of getting exercise except at intervals. Once he gets to the Tropics his pay is increased perhaps two or three fold; his messing and lodging are bettered; and exercise, even horse riding, is daily possible except in very out-of-the-way places. To send him abroad may probably cure his ailment, and prevent him becoming a chronic dyspeptic, with all its complications, to which he speedily drifts if he remains at home. It is on these grounds, and on these alone, that a young man with a dilated stomach can be allowed to go abroad, and the medical examiner has to take the risk of the change effecting a cure, otherwise the rejection of candidates otherwise suitable would be 50 per cent. and over. The condition of the heart also causes hesitation on the part of the medical examiner to pass the candidate. The strenuous and occasional exercise has told its tale; by the time the young man reaches 22 years of age (a usual age at which he comes up for examination) the heart is increased in bulk, the pulse-rate may reach 110 to 130, and is at the same time irregular, now fast, now slowed. The quicker pulse is put down usually to "nervousness," a mere delusion, for the pulse of a man with a healthy heart will not increase to well nigh double the rate under the "excitement" of being examined physically. The rate of the pulse is due

to the irregularity of exercise, the heart has lost its balance owing to the alternating, excessive and complete absence of exercise. The apex beat is well to the left, the chest wall throbs violently, and the epigastric pulsation is pronounced. Such a candidate has usually a dilated stomach, and not infrequently a trace of albumin in the urine. He looks older than his years, and is of a reticent and secretive disposition. Should such a man be allowed to go abroad? Not as he presents himself. He should be given three months' reprieve, and be told to live a healthy life; his exercise should be regulated, and a dietary should be laid down for him to follow. If at the end of three months' care and treatment the signs and symptoms from which he suffered have not disappeared, or at any rate showed marked evidence of improvement, it will be necessary to defer further examination for twelve months, or to state that the candidate is unfit for service in a tropical country. Now and again a young Oxford or Cambridge student comes up for examination; from one cause or another he has given up his University, and has determined to take to a commercial career. University life has, not infrequently, left its physical stamp upon him; he has been passing through the stage of no hat, no overcoat, no umbrella, no underclothing, no lunch, and excess of athletics. His heart is dilated; his pulse quickened, albumin in the urine occurs in 30 per cent. of such men, and the temperature at 12 noon is as a rule one to two degrees above the normal. Can such a candidate be passed? Were it left to the writer he would advise the employer not only to refuse the candidate on physical grounds, but on intellectual grounds alone; for a man who has not the mental capacity to know how to clothe and feed himself and conserve his energies cannot be of much value to any commercial firm, for his grasp of things must be at a low ebb indeed. The young chartered accountants who seek employment abroad belong to a class with which the medical examiner has, as a rule, a good deal of trouble. They are usually some 22 years of age; they have just passed their examinations qualifying them as accountants. They are usually "run down" to a degree; on inquiry they will be found to have been working very hard, they have had no time to take exercise, and they present a picture of unfitness. Training for chartered accountants means whole days spent in an office, their time for study is limited to a degree, and they have to sacrifice everything that could promote their health to passing their examinations. The consequence is the medical examiner finds it difficult to ascertain how much of the usually deplorable condition in which they present themselves is due to developmental physical inefficiency, or whether it is a mere temporary phase caused by overwork. No chartered accountant ought to present himself as a candidate for service abroad until at least three months after having passed his examination, for if he does so the medical examiner will require, as a rule, to send him away and advise him not to come up again until after a three months' holiday.

Reprint.

INJURIES AND DISEASES OF MAN IN AUSTRALIA ATTRIBUTABLE TO ANIMALS (EXCEPT INSECTS).*

By J. Burton Cleland, M.D., Ch.M.(Syd.)
Government Bureau of Microbiology, Sydney.

It has seemed to me of interest and value to bring together, in one connected whole, all references to injuries or disease in man attributable to animals that have been recorded in the Commonwealth of Australia, and to incorporate with this such unpublished information as I have been able to obtain myself or through friends. The accompanying paper is the result of these labours. It does not include snake bite, platypus poison, bites of the red-backed spider, and injuries from Insects. Dr. Tidswell has elsewhere dealt with the three former, and I have myself collected together data on the latter which were submitted to the Australasian Medical Congress last year. I am indebted to many kind friends, who are severally mentioned in their proper places, for much valuable information and for references. I am well aware that these records are incomplete, but trust that those readers who detect omissions, or who have further information to supply, will be good enough either to communicate such to me, or to bring forward themselves such material as they possess.

Class Mammalia.

Injuries from Man.—The injuries received in assaults and murders are not dealt with here, being merely the same as occur in other parts of the world. As regards injuries received from aborigines, very few medical accounts of these appear to be available, though many deaths have occurred during the colonization of Australia. The weapon chiefly used would seem to be the spear, its head being formed of chipped stone, broken telegraph insulators, bottle glass with jagged edges, fencing wire, &c.

Dr. Gaspare Spellini† has recorded in this connection, "Two Cases of Spear Wounds Penetrating the Chest." Both cases occurred in North Queensland. In one, a Chinaman, the spear was embedded in the body for fully ten inches. The lung was evidently injured, as a roaring escape of air accompanied the movements of respiration, but other important parts had escaped. The spear, with its iron point and barb made of fencing wire, was extracted and the patient recovered. The other case had ridden eighty miles on horseback with a spear in his body. This was removed but the head was left behind embedded in the lung. Next day, bleeding set in and the patient died of pulmonary hæmorrhage.

* Reprinted from the *Australasian Medical Gazette* of September 14 and 21, 1912, by permission of the proprietors.
† *Aust. Med. Gaz.*, Aug., 1885, p. 269.

In Dr. Wilson's narrative of a voyage round the world (p. 148), mention is made of a soldier of the 29th Regiment who was speared near the camp at Raffles Bay in 1827 or 1828. The wound was dangerous, but the patient recovered.

Injuries from other Mammals.—The native rats are for the most part few in number, and of small size. Records of injuries from them seem unknown. In Flinders' "Voyage to Terra-Australis" is a record of one of the sailors having attacked a large seal (this would be *Arctocephalus Forsteri*), incautiously at Kangaroo Island on April 15, 1802. He received a very severe bite in the leg in consequence, and was laid up until the ship's arrival in Sydney on May 9. I know of no records of injuries from whales.

Amongst the marsupials, doubtless injury is sometimes received from the claws or teeth. The large kangaroos, given the opportunity, by hugging their antagonist and ripping his body with their hind claws, could produce, and doubtless have produced, fatal injuries in man. Carnivorous marsupials, such as the Dasyures (native cats), the Tasmanian Devil (*Sarcophilus ursinus*), and Tasmanian wolf (*Thylacinus cynocephalus*), might inflict severe wounds by their teeth.

Injuries from the spurs of *Ornithorhynchus anatinus*, the platypus, are included in Dr. Tidswell's "Researches on Australian Venoms."

Class Aves.

Injuries from Birds.—Birds do not seem, at first sight, likely to have any medical interest. Nevertheless, accidents may be attributable to them and one disease, psittacosis, due to an organism allied to the colon-like, food-poisoning group, is said at times to be conveyed by certain American parrots to man. This disease has, however, not been recorded as yet from Australia.

Our common "magpies," or piping crow-shrikes (*Gymnorhina tibicen* and *G. leuconota*) are, as many school-boys know, very aggressive during the breeding season. At this time, they will swoop down within an inch or so of the heads of unfortunate urchins, rarely of adults, and have, I believe, been known in this way to strike through the headgear and inflict a wound. Our wedge-tailed eagle (*Uroœtus audax*) has been known to attack and injure a boy near Bathurst, breaking his leg. The crow (*Corvus coronoide*) or raven (*Corone australis*), which so frequently attacks the eyes of lambs and dying sheep, has been stated to have gouged out the eyes of an unconscious man lying in the open.

Class Reptilia.

Injuries from Crocodiles.—Along the northern parts of Australia, crocodiles (*Crocodilus porosus*), popularly called alligators, are a definite source of danger. There seem no records of the nature of the injuries received. Banfield, in his "Confessions of a Beachcomber," refers to a native who was killed by one of these animals.

Injuries from Turtles.—Banfield* says that, in some localities in the north of Queensland, the flesh of the hawksbill turtle (*Chelone imbricata*) is said to be imbued with a deadly poison. "Great care is exercised in the killing and butchering, lest a certain gland, said to be located in the neck or shoulder, be opened, as flesh cut with a knife which has touched the critical part becomes impregnated. One old seafarer acknowledged that he nearly 'pegged out' as the result of a hearty meal of the liver of a hawksbill."

Banfield also states that the flesh of the luth or leathery turtle (*Dermochelys coriacea*), which diets on fish, crustacea, molluscs, radiates and other animals, causes symptoms of poisoning. The species occurs in Torres Straits, though it is not common near Dunk Island.

Injuries from Snakes.—This portion of the subject has already been covered by Dr. Frank Tidswell in his "Researches on Australian Venoms."

Class Pisces.

Injuries due to Fish.—Injuries received from fish may be divided into two classes, *viz.*: (1) Those directly due to injuries from bites, spines, &c.; (2) cases of illness due to eating poisonous fish.

(1) The various sharks have a bad name along the whole coast of Australia as attacking man wherever the opportunity is present. The injuries received are frequently fatal, even when the individual is rescued.

The following particulars of a recent case in Sydney have been kindly furnished me by Dr. Prevost. The accident occurred on January 26, 1912, high up an estuarine creek in deep water. The victim, in company with others, was bathing when he was suddenly seized, a large piece of the tissues of the inner side of the thigh being bitten out, the wound extending from two inches above the patella to the groin, including the penis and scrotum, but not entering the abdominal cavity. In its upper part it extended down to the bone. The bite was clean cut as if made by a knife, leaving no ragged edges, teeth marks or lacerations. The gaping ends of the profunda artery and femoral vein were similarly sharply divided as if incised, and the nerves appeared as if cut. The part seemed almost as if it had been gouged out. Though at imminent risk, the patient was rescued. He died from hæmorrhage and shock probably in about half a minute and before removal from the water. About forty-eight hours later, the shark itself was caught and was identified by Mr. D. G. Stead as a "whaler" (*Carcharias brachyurus*). About two inches from its vent, were found the penis, scrotum and part of the adjacent tissue of his victim, almost unchanged, though this amount of tissue was much less than that originally bitten out. In its stomach were some corned beef and fish.

* "Confession of a Beachcomber," p. 158.

On February 20, 1912, the daily papers in Sydney recorded another case of an attack by a shark, in which the victim fortunately escaped severe injuries. The accident occurred at Coogee, Sydney, the patient foolishly having left the baths and swum out into the surf. A shark pursued him, and in spite of splashing and kicking, bit a piece out of his right leg, severely lacerated the left, and tore the right heel, then leaving him, when he managed to swim ashore.

Amongst the Rays, those commonly called "Stingrays" are considered highly dangerous. They can produce a severe wound by means of the long-barbed spine attached to the tail. From the habit of lying partly covered over in the sand they are naturally very dangerous objects to those who come upon them unawares.

In a paper entitled "On Fish Poison" (*Australian Medical Journal*, September, 1877, p. 273), by Dr. E. M. Wirth, Surgeon to the Burdekin and Flinders District Hospital, Queensland, is the following account of a Stingaree or Stingray. "The fish possesses a long, flexible, whip-like tail, terminating in a bony spine, very sharp at the point, and furnished with sharp cutting teeth. When the ray attacks, it strikes its tail around some part of the victim and forces the spine into the flesh, causing a deep and lacerated wound. The fishermen say that the barbed spine is covered with some thick gelatinous substance, containing probably the poison.

A Chinaman, aged 20, was attacked in 1877 while net-fishing by a Stingray, afterwards killed. He felt a heavy body forced against his back and simultaneously a cord tightly drawn in lassoo fashion round his thigh. As this tightened, he felt a sharp body enter his thigh. The fish was killed and he was rescued. The patient fainted, but afterwards regained sensibility, but with paralysis and complete numbness of the injured limb. A fortnight later, the patient's strength failing, and a frightful odour coming from the wound, he was brought to hospital. On admission he had a peculiar stiff look and unusual glassiness of the eyeball, extreme weakness bordering on collapse, pallor, feeble heart, but ravenous appetite. The injured leg was not swollen, but sensibility was lost. There was a jagged, irregular sloughing wound, 2½ in. deep, with a copious, very sickening, fœtid, thin and dark grey discharge resembling the smell of rotten fish. There was no inflammation. With treatment the sloughs gradually came away, though small subcutaneous abscesses developed on the limb, large parts of muscles came away exposing the bone. Finally granulation occurred, though meanwhile the same fœtid pus collected in the knee-joint. The patient eventually walked out cured on August 30."

The various cat fish belonging to the family *Plotosidæ* are common in Australian waters, whether estuarine or river. The injuries done by these animals are very severe and out of proportion to the mechanical laceration of the parts. They possess three spines, one dorsal, and two lateral, which under ordinary circumstances are covered by skin. When the fins, which are attached behind them, are erected and put upon the stretch, the skin is burst through and the sharp pointed spine projects. At the base of the spine, by means of microscopical sections, I have been able to find a racemose gland, doubtless providing the poison which enters the wound made by the spine. I have not been able to follow out the duct by which the secretion escapes. In some estuaries injuries from these fish are very common.

The following description, probably referable to the catfish (*Cnidoglanis bostockii*, Castlenau), was obtained from a boatman's wife at Perth, in West Australia, detailing her own and her husband's experience. The latter, at the time of interview, September, 1909, was actually recovering from such an injury. She says that about twenty minutes after the injury is received, the finger feels numb and goes white, and pain shoots up the arm; if the injury be from a live fish, the symptoms are more severe. The dead fish, if trodden upon by naked feet, will produce severe symptoms; even the touch without a wound will cause symptoms. Pain in the armpit follows, if the lesion has been on the hand, and three or four hours afterwards a lump. The pain sometimes stops for several hours and then comes on again, and is very severe and of a shooting nature. It sometimes lasts as long as five days. Vomiting may occur at the beginning, though there is no sweating. The patient feels exhausted, and as if he would like to cut off the limb. If the end of the finger is "stung," for two inches above the part it becomes quite white and has a burning feeling. It can be put into boiling water without feeling any pain—it has in fact lost its feeling of heat or cold. It does not fester and blisters do not form. Her husband had been stung the day before about 11 a.m., and the aching had continued until 10 a.m. that day. He could not sleep during the night, and he felt as though he must hold the limb up. The treatment they adopt is to put the finger into kerosene. The effects of the female fish are more severe than those of the male.

Numerous other oral accounts of similar injuries have all given very much the same history of the sequence of events. Extensive sloughing and secondary infections may apparently occur, as I know of an instance in which a boy's leg had to be amputated, following on an injury received from standing with bare feet on a dead "cobbler," as the fish is called in Perth. The injuries thus received from the catfish resemble very closely those inflicted by the spines of the "weaver" fish (*Trachinus draco*). Sir James Paget (*Surgical Pathology*, 1870, p. 368) refers to its effect on his brother, who suffered intense pain at the part affected and up the arm. Next day a black slough appeared at the puncture.

In searching through the medical literature of Australia, references to injuries caused by the spines of these fish are very rare. The only one I have found was in the *Australian Medical Journal*, vol.

10, 1865, p. 174, where a quotation is given from the *Riverina Herald*. It is as follows, the catfish being evidently the *Tandanus tandanus* of Mitchell: "The bite of the catfish or Murray eel, as it is sometimes called, appears to be exceedingly dangerous. Poor old Flora, the black lubra, whom we mentioned as having been injured by one of these creatures while wading through a swamp a month or two ago, has still a very bad foot and there does not seem any present likelihood of her recovery."

Mr. A. MacCulloch, of the Australian Museum, has been good enough to give me the following references from Tenison Wood's "Fish and Fisheries of New South Wales," 1882. Writing (p. 81) on the Estuary Catfish, *Cnidoglanis megastomas*, Richardson, he says: "There can be no doubt that these spines are really venomous, and to be punctured by one of them is a really serious matter. Not only is the pain intense, but the after consequences are generally grave. . . . They give to fishermen a great deal of trouble with their nets, and often get their thorns entangled endeavouring to get through the meshes. William Annan, an aboriginal, accompanied a party net-fishing to the head of Darling Harbour one afternoon; the place was already celebrated for catfish, and after the net had been hauled, and being prepared again for the boat, a part of poor William's hand came in contact with the thorns of one of the catfish. This gave him great pain, and soon commenced to inflame, in consequence of which he had his arm amputated to save his life. He lived long afterwards, and was useful and cheerful when out with fishing parties."

The same author quotes (p. 49) Mr. Hill on the Fortescue, *Centropogon Australis*, Gunther; not *Pentaroge marmorata*, as he names it. "We were out fishing one night with a net towards Chowder, a bay in this Harbour, and were accompanied by a black fellow named Wallace. He got hold of one of these fishes, which was in the net rolled up, and he had put his whole force and pressure upon that spot. I never saw anyone in such pain for a short time. He rolled on the beach, then got up and ran about like mad. I was necessitated to give him at intervals all the grog that we had, and which consisted of nearly a quart of strong spirits. This was scarce enough to cause the pain to leave, but it had the effect of deadening it, and in a couple of hours we were enabled to remove him to his camp, when a good sleep and the effects of the grog put him right again. Strong ammonia is the best thing which can be applied to these parts when stung with a fish-bone."

The same author, writing on the Bull-rout, *Notesthes orbusta*, Gunther (p. 48), says, "Another peculiarity is that the spines about the head are venomous, and inflict most painful stings. . . . Now if any of these spines chance to wound you, which they may easily do, for they are as sharp as needles and very strong, the pain is intense. It runs through the whole limb like fire. The injured part becomes red and inflamed. But except the pain, which all victims assert is very agonizing, there are no serious consequences. . . . . Its sting is most frequently felt by bathers, who tread upon it as it lies on the bottom amongst the weeds. The blacks held it in great dread, and the name of Bull-rout may possibly be a corruption of some native word. The venom is probably a mucus secreted by the skin, and not connected with any distinct poison gland."

The stone fish (*Synanceja horrida* L.), which occurs off the Queensland coast, can inflict a dangerous venomous wound. E. J. Banfield, in his "Confessions of a Beachcomber," says that the blacks treat such a wound by immersion of the part for a whole day in running water. The creature is pacific and harmless until handled or inadvertently trodden on. "A full dozen of the keenest of spines, all in a row, extend from the depression at the back of the head towards the tail, each spine hidden in a jagged and uneven fringe, which, when the fish is in its natural element, can scarcely be distinguished from seaweed. Each spine is surrounded by a sac of colourless liquid (presumed to contain the poisonous element), which squirts out as the spine is unsheathed. On the sides, and in lesser numbers on the belly, are irregular rows of miniature craters, which on being depressed eject to a distance of a foot or more, a liquid resembling in colour milk with a tinge of lavender. From almost any part of the body this liquid exudes or can be expelled."

Saville-Kent* also refers to its poisonous properties.

S. verrucosa, found at Port Darwin, as a label attached to a specimen in the South Australian Museum states, possesses similar organs containing a milky poison near the points of the spines.

Saville-Kent† says that some of the Muræniæ or reef-eels, which may attain a length of six or eight feet, being of aggressive habits and armed with formidable teeth, command wholesome respect from the fishermen. *Muræna tesselata*, Rich., is very pugnacious, and specimens a foot or so in length will strike viciously at, and draw blood from, the hand that attempts to capture them. He also states that an allied and very ferocious species of reef-eel, attaining to a length of twenty feet, has been reported to him as frequenting the vicinity of some of the South Sea Islands, where it is more dreaded than sharks, and from the same locality likewise, a small species of electric eel. He has also heard rumours of a Barrier Reef electric species.

Banfield states that the monstrous Groper, *Promicrops italara*, will follow a man in the water with dogged determination foreign to the nervous suspicious shark. He relates the case of a young black-boy, diving for bêche-de-mer, who was attacked in this way, the fish taking his head into his capacious mouth and mauling him severely about the head and shoulders.

(2) *Fish Poisonous to Eat.*—Very few references

* "The Great Barrier Reef," p. 286.
† *Ibid.*, p. 303.

to poisoning by fish, apart, that is, from putrid or bacteriologically contaminated fish, fresh or tinned, occur in Australian literature. The following appears in Aflalo's "A Sketch of the Natural History of Australia," 1896, p. 247. "The poisonous toads (*Tetradon*) and porcupines (*Diodon*), relatives of the huge but harmless sun-fish (*Orthagoriscus*), have often caused accidents to those careless or ignorant enough to eat them. Some lads were poisoned in this way at Coogee not many years ago, and a family of three died early in the century from the same cause."

I am indebted to Mr. A. MacCulloch, of the Australian Museum, for the following reference (Richardson, Zool. Erebus and Terror, Fishes, p. 63, who quotes Mrs. Meredith, Notes of New South Wales, London, Murray, 1844, p. 155). Writing on the toad fishes, *Spheroides hamiltoni*, Richardson, from Port Jackson, he says, "They are highly poisonous. . . . . I know one instance at least, of their fatal effects; a lady, with whose family I am intimate, having died in consequence of eating them.

According to the *Australian Medical Journal*, two boys died at Randwick in 1871 from eating some catfish caught in Coogee Bay and cooked on the beach. They walked home in great suffering, and died almost immediately.

Phylum Mollusca.

Bites of Shellfish of the Genus Conus.—Through the kindness of Mr. Charles Hedley, F.L.S., of the Australian Museum, Sydney, who has kindly placed the following references to bites from shells of the genus *Conus* at my disposal, I am able to submit a number of valuable accounts of the severe effects produced in man by careless or inexperienced handling of these animals. Save that one of the implicated species is found along the Great Barrier Reef, the subject is hardly to be considered as strictly Australian, but, in view of the interest attached to the observations, it seemed well to take this opportunity of bringing the references together. I am also much indebted to the courtesy of Mr. R. Etheridge, Curator of the Australian Museum, for permission to use the very valuable information supplied by Dr. Corney, the original of which is filed amongst the Museum Records.

The accounts have been arranged with some attempt at chronological order.

Adams, A. (Zool. of the Voy. of H.M.S. "Samarang," p. 19, 1850).—The following account of the bite of *Conus aulicus* is given:—

"Its bite produces a venomed wound, accompanied by acute pain, and making a small, deep triangular mark, which is succeeded by a watery vesicle. At the little island of Mayo, one of the Moluccas near Ternate, Sir Edward Belcher was bitten by one of these cones, which suddenly extended its proboscis as he took it out of the water with his hand, and he compared the pain he experienced to that produced by the burning of phosphorus under the skin. . . . . The instrument which inflicted the wound in this instance was probably the tongue, which in these molluscs is long and armed with two ranges of sharp-pointed teeth."

Gray, J. E. (*Ann. Mag. Nat. Hist.* (2), xii, p. 178, August, 1853).—Gray quotes the above account, and says that Mr. Adams informed him that the cone adhered to the hand by its mouth like a leech, as described by Adamson.

Bennett ("Gatherings of a Naturalist in Australasia," 1860, p. 382) says, in a footnote: "The common *Conus textilis* of Linnæus is found at Anaitum, and other islands of the New Hebrides group; the animal is poisonous. On biting its captor, it injects a poisonous and acrid fluid into the wound, occasioning the parts to swell, and often endangering the life of the injured person."

Mr. Hedley informs me that this information is repeated by Coxon (*Proc. Roy. Soc. Q'land*, x, 1893, p. 3).

Crosse and Marie (*Journ. de Conch.*, xxii, 1874, p. 353).—The authors give the following information, roughly translated, about the poisonous bites of *C. textile* and *C. tulipa*, Linne., New Caledonia.

The fact already mentioned by many English naturalists of the venomous properties of the bite of *C. textile* was confirmed at New Caledonia. After an ocular test, a native of Ponebo, having been stung on the hand, found in his hand and the corresponding arm a considerable swelling accompanied by very severe pains; this swelling persisted for some time. In this country the error is committed of attributing to the operculum of the cone the act which proceeds from its lingual teeth.

C. tulipa, Linne., Ille Art, Ile des Pins, Ile Lifon. According to M. le Dr. Marie, the bite of this animal is as venomous as that of *C. textile*.

Woodward ("Manual of the Mollusca," 3rd Edition, edited by Ralph Tate, 1875, p. 228).—In speaking of the genus *Conus* it is stated that these *C. aulicus* sometimes bite when handled.

Montrouzier, R. P. (*Journ. de Conch.*, xxv, 1877, p. 99).—This writer states that at one of the Loyalty Islands, *C. marmoreus*, which occurs abundantly, was known to cause accidents by the bite of its lingual apparatus. In the New Hebrides accidents, caused by the bite of *C. textile*, were frequent.

This species, Mr. Hedley informs me, occurs off the Queensland Coast (Great Barrier Reef).

Garrett, A. (*Journ. of Conch.*, i, 1878, p. 365).—This article contains the following information: *C. tulipa*, Linn. (Viti Islands, Tonga, Samoa, Kingsmill Island, Caroline Islands, Cook's Islands, Society Islands, Panmotu Island, Marquest Island, Sandwich Islands).

"When collecting at the Panmotus, I found three examples of this species, and held them in my hand while searching for other shells, when one suddenly threw out its long slender proboscis and punctured one of my fingers, causing sharp pain not unlike the sting of a wasp."

Hinde, Dr. B (*Proc. Linn. Soc.*, N.S.W., ix, 1885, p. 944).—In this article Dr. Cox read a letter from Dr. Benjamin Hinde, R.N., of H.M.S. "Diamond," containing information in reference to

the poisonous effects of the bite inflicted by *Conus geographus*, Linn., on the natives of New Britain. The summary of this is as follows: His attention was first directed to the question by a native of Nadup, of New Britain, who, seeing him with the specimen of *Conus geographus* in his hand, remarked, "Suppose he bite he kill me." On further questioning the native stated that the fish would bite, and that the bite was poisonous, and it always killed people unless they cut themselves all round the place bitten so as to let the blood run. Mr. R. Parkinson, of New Britain, cotton planter, also supported the statement as to the effects of the bite of the *Conus*. Later Dr. Hinde himself saw a native on the Island of Patupi, Blanche Bay, New Britain, who had been bitten by one of these shells, at once cut small incisions with a sharp stone all over his arm and shoulder, from which the blood flowed freely, and he explained that if he had not taken these precautions he would have died. On examination of the place where he had been bitten, a small mark about the size of a threepenny piece between his finger and thumb was seen. Upon close examination of this area, two small incisions in the centre were seen, from which evidently no blood had come. He stopped the blood of the numerous cuts on his arm and shoulders with hot wood ashes, and the arm seemed to be stiff and useless for the time. But Dr. Hinde did not know whether the effects of the bite or the cure were responsible for this state. Many other natives when questioned stated that the bite of this cone was deadly. Dr. Cox also mentioned that the Rev. W. Wyatt Gill had recorded the fatal effects of the bites of *C. textilis*, Linn. Mr. Hedley has been unable to find this reference. Mr. Brasier had also informed Dr. Cox that he had known severe effects caused by the bite of *Conus tulipa*, Linn.

Hedley, C. (Appendix to Thomson's "British New Guinea," 1892).—Information from a Papuan, p. 283. Copied by Cooke (Cambridge Natural History, Mollusca).

Mr. Hedley says that "The natives are quite aware of the poisonous bite inflicted by several of the Cones. While collecting on a coral reef, I once rolled over a boulder and exposed to view a living *Conus textile*. Before I could pick it up, one of my coloured companions hastily snatched it away, and pointing to its "business end," explained with vivid gesticulations, its hurtful qualities. He would on no account allow me to handle the shell, but insisted on putting it himself into my bottle of spirits."

Hallen, Dr. A. Herbert.—The following report by Dr. A. Herbert Hallen was forwarded to the Australian Museum, Sydney, by Dr. B. G. Corney, from Fiji, September 10, 1901. Accompanying it was a shell, identified as *Conus geographus*, said to be similar to the one that inflicted the severe bite described. The following is the extract from the Government Medical Officer's Report, Levuka, for the month of June, 1901:—

"I had under observation the case of an European lady here who was the subject of a severe form of poisoning by a shell-fish, of the species of which a shell is now sent for identification.

"The lady was fishing not far from the shore in the evening, with her family and native servant in the boat. The shell-fish having been obtained, the boy cracked it to extract the meat, which was large in quantity for the size of the shell, and having cracked the shell, handed it to his mistress with the meat hanging from its internal attachment. To free the flesh she inserted her little finger towards the upper end, and, she declares, felt the animal shoot out a sharp-pointed thing which penetrated her finger and caused such a peculiar sensation that she at once called out that she was bitten and poisoned.

The poisonous matter is said to be the yellow pulpy matter at the thicker end of the shell; it might, of course, be merely reproductive or digestive tissue, or again there might well be a modification of some secretory gland to form a protective poison gland, and in the latter case, nature would surely provide along with the poison, some mechanical means to promote injection into an enemy.

"The point of puncture in this case was minute, and only to be seen with great care; indeed, that it was a puncture was much less readily seen than the local effect of the poison which caused a bluish discoloration of the surrounding tissues. It was situated at the point of the patient's little finger near the side of the nail. Through so small a puncture, and in so short a time as was allowed to its insertion (she did not unfortunately suck the wound), but a most minute quantity of the poison could have entered the circulation, yet the effects were most grave. Locally a numbness was first experienced. This extended rapidly up the arm, which became paralyzed, and the paralysis spread thence rapidly throughout the body. It was peculiar that not only was general muscular control abolished, even so far that the head had to be supported over the trunk in order that unimpeded breathing might be allowed to continue; but there was a loss also in a lesser degree (as I think) of sensation, with numbness and 'pins and needles' beginning in the arm and becoming generalized through the body, and to more marked degree there was a disappearance of muscular sensation and a complete absence of knee jerks. The patient constantly asked where her limbs were. Utterance was thick and indistinct. The respiratory and cardiac muscular apparatus did not at any time participate to a dangerous degree in the paralysis. The stomach, however, may have been affected (or was it the *recti abdominis* and other abdominal muscles) for I could not induce vomiting. When at its worst some three or four hours after the poisoning began, the condition distinctly affected the throat, and a good deal of distress was caused by the difficulty in removing accumulated fluid. The poison seemed to me to clearly belong to the class of which *curari* is the type. Of this I felt assured as soon as I had examined the patient and observed the freedom of the respiratory and circulatory centres from its actions compared with the absolute abrogation of

voluntary muscular paralysis so that, the patient weighing sixteen stone odd, I felt a good deal of anxiety as to whether the arms would not dislocate at the shoulder when the body was lifted in the chair by the hands under the armpits; indeed it was exceedingly difficult to move the patient, all the parts being so abnormally yielding. The treatment I adopted was merely directed to the sustaining of life till the poison should have been destroyed. The heart and lungs were quite equal to their work if other circumstances could be kept favourable. This was done by placing the patient in a semi-recumbent position in a canvas chair, and by keeping the head in such a position that breathing and swallowing were facilitated. I should have liked to relieve the circulation by inducing vomiting, but failed to do so. Had I had strychnine with me I should have injected it hypodermically, but I did not feel justified in leaving the patient to get it. Urination was involuntary. The worst was past in about six hours. The wound was made about 9.30 p.m. Paralysis lasted on with steadily diminishing intensity till late next day, but the numbness lasted considerably longer in the injured finger, and for a month after the patient experienced a shock in the little finger on hard impaction—as in playing the piano. This was the last symptom to clear up, unless the sore eyes which began and lasted later are to be attributed to this poison as their cause. Though natives declare that recovery from fish poisoning is often complicated by sore eyes, yet I am not aware that the tradition would apply to this kind. I have heard since of other cases of this kind of fish poisoning, and among others of a Kadava woman who died before she could be got from the shore."

(To be continued.)

Notes and News.

THE SECOND ALL-INDIA SANITARY CONFERENCE AT MADRAS.

(Concluded.)

Town Improvement in Lucknow.

The Honourable Rai Ganga Prasad Varma Bahadur (Lucknow), in his note on "Town Planning and Town Improvement," gave an account of four town improvement schemes that had been successfully carried out by the Municipal Board of Lucknow. He advocated large State expenditure on improvements and the grant of facilities. He thought that land for new houses should be sold freehold or given on ninety-nine years' lease. He was against levying any rate on unearned increments as people would be unwilling to pay any rate on their property merely for the fact that a new road was going to be constructed at some distance from their holdings. He laid special stress on the fact of having selected offices entrusted with land acquisition work. He thought that Government should encourage philanthropic bodies to form new "bastis," and that capitalists should be persuaded to find money for building sanitary houses. In his experience the people were ready and willing to spend ten rupees for every single rupee spent by the local body on town improvement schemes.

Building Bye-laws for Cities.

Major S. A. Harris, Sanitary Commissioner, United Provinces, in his paper on "Building By-laws for Cities," referred to the difficulty in enforcing by-laws, and gave instances of by-laws having been transgressed without adequate penalties. The control of the erection and re-erection of buildings was sought after by members in some municipalities, but many Municipal members complained of the worry to which they were subjected by their friends and electors to try to obtain some concession or escape from the operations of certain by-laws in their individual cases. It would be preferable if members were protected from those importunities by delegating their executive powers to an official chairman or to a health officer with whom the individual would have no direct concern. It was with a view to the relief of the members from an invidious position that health officers were enrolled in provincial service and appeals against their actions could only be directed to the Commissioner and the Sanitary Board. He sincerely hoped, therefore, that Municipal members would adopt a method of delegating their powers for the control and enforcement of by-laws.

Town Improvements and Drainage in India.

Mr. V. Devasikamani Pillai, Sanitary Engineer, Hyderabad, next read a paper on "Town Improvements and Drainage in India." He said that proposals for town and village improvements should go hand in hand with proposals for large cities. In every town and village in India they found congested areas and people went on building valuable houses in those areas, and those towns were far beyond the reasonable operation of sanitary rules and regulations. Sanitary inspectors and reports were very necessary there. There were several methods of improving smaller towns, some of which were:—

(1) Leaving open areas for ventilation by purchasing old unhealthy houses.

(2) Building up a new town close by the old and diverting the people to that locality in the way, having all public buildings constructed in that locality.

(3) Facilitating transit by extending tram lines to the extreme limits of the thinly populated area.

(4) The introduction of several public bathing houses, latrines and urinals would considerably improve the health of the people as well as their houses.

(5) The construction of public schools for children was very essential. It had a great education value, for the children would be trained to have higher ideas of sanitation when they saw a fine house in the school.

(6) Great attention must be given to the health of children by scattering over the whole town small playgrounds.

(7) As pure air was very essential, town improvement trusts and village improvement trusts must be immediately organized.

(8) Surface drains must be immediately built.

SMALL RESIDENCES ON TRUST ESTATES.

The following short note on "Small Residences on Trust Estates," prepared by Mr. Watson, Engineer to Bombay City Improvement Trust, was then presented:—

Formerly houses were built closely packed together as a security against robbery and physical violence, but in a more peaceful age such necessity no longer exists. In spite of this, however, and on increasing recognition of the fact that overcrowding underlies the prevalence of numerous diseases, is productive of plagues and epidemics, and reacts generally in a deleterious manner on the mental, moral and physical welfare of the human race, great difficulty, owing to apathy on the part of the tenant and the avarice of the house owner, is still experienced in launching any scheme of improvement.

The solution lies in co-operation between the two classes, and the paper proceeds to show how this is possible to the advantage of both, decent sanitary accommodation at a reasonable rental to the tenant, and a fair return of his capital to the owner. A large area of land recently acquired by the City Improvement Trust, Bombay, is taken as an example, and plans showing the "lay out" are discussed, types of houses with drawings and estimates of cost are shown, and the whole financial details of the scheme explained.

RELIEF OF CONGESTION.

Dr. Amritaraj, Health Officer, Civil and Military Station, Bangalore, next introduced his paper on "The Relief of Congestion in the Civil and Military Station, Bangalore, and Results." In doing so he said that attention was first directed to the need of sanitary reform by the periodical recrudescence of plague from 1898 onwards, and though minor improvements were made, the real campaign against congested and insanitary areas commenced in 1906. In this year a thickly-populated area of the native bazaar, known as South Blackpully, was chosen for demolition and reconstruction on improved lines. This area which covered 51.53 acres contained 1,952 houses with a population of a little over 12,000. In selecting houses for demolition, main thoroughfares were avoided and new roads were driven through the worst slums so as to facilitate the circulation of air, and open spaces were provided. A large population was necessarily unhoused, and to provide accommodation for these people, and also to encourage emigration from slum areas, a plot of land of 50.35 acres in extent was acquired and laid out in plots for building purposes. In this area, now known as "Fraser Town," all facilities were given for building, but under improved building regulations which are detailed, and up to date, no indigenous case of plague has occurred there. Now a further extension of 47 acres has been acquired, and this is being laid out, and it is hoped that the sale of plots will cover not only the cost of acquisition, but also the laying out of roads and drains, water and light, and a central park. Various details of the improvement schemes are given and the better health conditions which have resulted are shown in a series of statistical appendices.

Dr. Nair said that he did not want to go into details, but there was one particular idea underlying them all: he would like to have an expression of opinion from that Conference on the following point, Was a municipality justified in acquiring more land than is absolutely necessary for an improvement, and selling the remaining land, after the improvement had been effected, at the enhanced rate caused by the improvement? This appeared to be permissible in Bombay and Calcutta, but it was not so in some of the local Governments of India. In the opinion of the Madras Government only what was required for the improvements was allowed to be retained, and the rest had to be resold to the owner at a price at which it had been bought. If that opinion were generally held, the cost of improvements would fall heavily upon the local bodies, whereas if the land could be retained and sold at the enhanced price the cost could be easily met by the profits. He would not press the Conference to pass a resolution at that time, but he would like the Conference to pass a resolution on that point on Saturday next.

The Honourable Rai Ganga Prasad Varma said that local bodies have power to acquire land for frontages of new houses. A question was put to the Legislative Council of the United Provinces, and that was the opinion they had given in reply.

Dr. E. G. Turner pointed out that Bombay had power to acquire land outside the plot required for improvements, and to resell it at a higher price.

The Honourable J. P. Orr said he thought it was the policy of the Bombay Trust to take up more land than was required for the improvements. He thought it was fully justified when they considered that if they only took up so much as was required for roads the owners on either side had their land bettered but paid nothing for it. It was because of that that he thought the municipality should be allowed to take up more than is required for its roads, and they would thus get the benefit of a better return for their improvements.

Babu Bepin B. Bramachari, L.M. and S., asked whether the Corporation could deliberately take more land than was necessary for public utility with the view of making a profit for public works.

Major W. W. Clemesha said that he thought that what Dr. Nair was inquiring was whether the Land Acquisition Act in any province would allow of acquiring more land than was required for public purposes. They were not entitled to take more land and resell it under that Act. It was necessary, if that was desired, to have a special enactment. It could not be done under the present Land Acquisition Act. This ended the discussion.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

THE *RÔLE* PLAYED BY FUNGI IN SPRUE.

By ALDO CASTELLANI, M.D.(Florence),
Director, Government Clinique for Tropical Diseases, Colombo,
AND
GEORGE C. LOW, M.A., M.D.,
Lecturer, London School of Tropical Medicine.

THE fungus theory of sprue is an old one. Kohlbrugge, in 1901, describing the ulcers on the tongue and the intestinal contents, found a fungus which he believed to be identical or closely allied to the *Oïdium albicans*, the hyphomycete known at the present time under the name of *Monilia albicans*. He observed the same organism in the stools and in the vomit of four other patients suffering from the same disease. He concluded that the fungus was the etiological agent of the malady.

This theory has later been upheld by many authorities, especially amongst Dutch and French observers. At the present day the hyphomycetic theory still has a number of supporters. Daniels states that it is possible that sprue is due to some yeasts, but it is not proved, while Le Dantec goes so far as to call the disease *Blastomycosis intestinalis*. This authority has described a saccharomyces as the cause of the disease.

Lately, having had the opportunity of studying several cases of sprue, we have carried out a number of researches to determine what *rôle*, if any, fungi play in the etiology of the disease. Out of a series of eight cases we have observed fungi, either in the saliva or stools, in all but one. The one in which they were absent was a typical case, but the stools were not frothy, their reaction was not acid, and as a general rule there was no diarrhœa.

Remarks on the Fungi found.—All the fungi found by us belong to the genus Monilia, namely, *Monilia enteric*, Cast., *M. fæcalis*, Cast., *M. insolita*, Cast., *M. intestinalis*, Cast., *M. rotunda*, Cast.

To these fungi already described by one of us (A. C.), we are now in the position to add another, a new species, of which we here give a brief description.

This fungus was isolated by us from scrapings taken from the tongue which were inoculated into maltose agar tubes. We may say in passing that certain cellular histo-pathological changes noticed by one of us recently, were seen in the scrapings. After forty-eight hours the inoculated tubes presented two types of colonies, some being rather large and of a creamy white colour, while others were extremely small, translucent, and dew-like. The latter were colonies of a streptococcus, the former were those of a fungus.

Subcultures of these were made in various sugar agars, in gelatin, in serum, and in a number of sugar broths.

The fungus on a slightly acid-solid sugar medium (maltose and glucose) grows very abundantly, giving rise to round colonies which soon coalesce into a creamy white mass with smooth surface. On this medium the fungus grows principally in the shape

TABLE I.—INTESTINAL MONILIAS.

	Litmus milk	Glucose	Levulose	Maltose	Galactose	Saccharose	Lactose	Mannite	Dulcite	Dextrin	Raffinose	Arabinose	Adonite	Inulin	Sorbite	Broth	Peptone water	Indol	Gram	Gelatine	Serum	Neutral red	Inosite	Salicin	Amygdalin	Isodulcite	Glycerin	Erythrite
Monilia enterica, Cast. ...	O / Alk	AG	AG	AG	AG	AG	O	As	O	As	O	O	O	O	O	C	C	O	+	O	O	O	O	O	O	O	O
Monilia fœcalis, Cast. ...	A	AG	AG	AG	AGs	AGs	O	O	O	O	O	O	O	O	O	C	C	O	+	O	OB	O	O	O	O	O	O
Monilia insolita, Cast. ...	As / Alk	AG	AG	AG	AG	AG	O	As	O	O	O	O	O	O	O	C	C	O	+	O	OB	O	O	O	O	O	O
Monilia intestinalis, Cast. ...	ADs	AG	AG	As	A	A	O	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O	O	O	O	O	O
Monilia rotunda, Cast. ...	AC	A	A	A	A	O	A	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O	O	O	O	O	O
Monilia decolorans, Cast. and Low	DFC	AGs	AG	AGs	A	A	O	O	O	A	O	O	O	O	O	C	C	O	+	O	O	O	O	O / Alk	O	O	A	O

TABLE II.—TABLE SHOWING MONILIAS SO FAR FOUND IN MAN, WITH NAMES IN ALPHABETICAL ORDER.

	Litmus Milk	Glucose	Lævulose	Maltose	Galactose	Saccharose	Lactose	Mannite	Dulcite	Dextrin	Raffinose	Arabinose	Adonite	Inulin	Sorbite	Broth	Peptone water	Indol	Gram	Gelatine	Serum	Neutral Red	Ino-ite	Salicin	Amygdalin	Isodulcite	Glycerin	Erythrite
Monilia albicans, Robin.	AC	AG	AGs	AGs	AG	Avs	O	O	O	O	O	O	O	O	O	CTP	C	O	+	+	+s	O	—	—	—	—	—	—
Monilia blanchardi, Cast. ...	Avs / Alk	AGs	A	A	A	A	O	O	O	O	As	O	O	Avs	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia bronchialis, Cast. ...	O	AG	AG	AG	O	AGs	O	O	O	A	O	O	O	O	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia burgessi, Cast.	O / Alk	AGs	A	AGs	A	AGs	O	O	O	O	O	O	O	O	O	C	C	O	+	O	OB	O	—	—	—	—	—	—
Monilia chalmersi, Cast.	As / Alk	AG	AG	As	AGs	AG	O	O	O	O	As	O	O	AGs	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia decolorans, Cast. and Low	DFC	AGs	AG	AGs	A	A	O	O	O	A	O	O	O	O	O	C	C	O	+	O	O	O	O	O / Alk	O	O	A	O
Monilia enterica, Cast.	O / Alk	AG	AG	AG	AG	AG	O	As	O	As	O	O	O	O	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia fæcalis, Cast.	A / DPs	AG	AG	AG	AGs	AGs	O	O	O	O	O	O	O	O	O	C	C	O	+	O	OB	O	—	—	—	—	—	—
Monilia guillermondi, Cast. ...	O / Alk	AG	AG	As	A	AG	O	O	O	O	AGs	O	O	O	O	CTP	C	O	+	O	O	O	—	—	—	—	.	.
Monilia insolita, Cast.	As / Alk	AG	AG	AG	AG	AG	O	As	O	O	O	O	O	O	O	C	C	O	+	O	OB	O	—	—	—	—	—	—
Monilia intestinalis, Cast.... ...	ADs	AG	AG	As	A	A	O	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia krusei, Cast.	O	AG	AG	O	O	O	O	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia lustigi, Cast.	As / D	A	AGs	Avs	A	AGs	O	O	O	A	AGs	O	O	O	O	C	C	O	+	O	OB	O	—	—	—	—	—	—
Monilia negrii, Cast.	Avs / Alk	AG	AG	As	AGs	AG	O	O	O	O	AGs	O	O	O	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia nivea, Cast.	O / Alk	AG	AG	AG	AG	AGs	O	O	O	O	AG	O	O	O	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia nitida, Cast.	A / DC	AG	AG	A	A	A	A	A	O	Avs	As or O	O	O	O	O	CTP	C	O	+	O	O	O	—	—	—	—	—	—
Monilia paratropicalis, Cast. ...	As / Alk	AG	AG	AG	AG	AG	O	O	O	Avs	O	O	O	O	O	CTP	C	O	+	O	O	O	—	—	—	—	—	—
Monilia perryi, Cast.	As / D Alk	A	AGs	A	A	AGs	O	O	O	O	As	O	O	Avs	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia pinoyi, Cast.	O	AG	AG	AG	O	O	O	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia pseudotropicalis, Cast. ...	ACs	AG	AG	O	AGs	AG	AG	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia pulmonalis, Cast. ...	O / Alk D	AG	AG	AG	AGs	AG	O	Avs	O	O	A	AGs	O	O	O	CTP	C	O	+	O	OB	O	—		—	—	—	—
Monilia rhoi, Cast.	As / Alk	AG	AG	Avs	AGs	AG	O	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia rotunda, Cast.	AC	A	A	A	A	O	A	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia rugosa, Cast.	A / PsCs	As	As	As	As	As	O	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O	—	—	—	—	—	—
Monilia tropicalis, Cast.	A	AG	AG	AG	AGs	AGs	O	O	O	O	O	O	O	O	O	C	C	O	+	O	OB	O	—	—	—	—	—	—
Monilia zeylanica, Cast.	ACS	A	A	A	A	A	As	O	O	A	Avs Gvs	O	O	Avs	O	C	C	O	+	O	O	O	—	—	—	—	—	—

Abbreviations used in the tables:—

A—acid; G—gas; C—clot (milk), clear (broth and peptone water); CTP—clear at first, then thin pellicle present. D—decolorized. P—peptonised (milk), pellicle (broth). Alk—alkaline. $\frac{A}{Alk}$—acid, then alkaline. s—slight; vs—very slight. B—brown pigmentation of the medium.

O—negative result, viz., neither acid nor clot in milk; neither acid nor gas in sugar media; non-production of indol; non-liquefaction of gelatine or serum, as the case may be.

+—positive result, liquefaction of medium. F—fine.

of a saccharomyces, but a few mycelial forms may also be observed, especially in the condensation water. On alkaline media growth is much less abundant, and there is a complete absence of mycelial forms. On gelatin the fungus grows fairly well, the medium is not liquefied. On serum growth is rather scanty, and there is no zone of black pigmentation round the growth, as is the case with some species of Monilia, such as *M. fœcalis*, *M. insolita*, &c. Litmus milk is first decolorized and then clotted, the clot being finely granular. As regards sugar reactions the fungus produces acid and gas in glucose, maltose, and lævulose, while it produces acidity without gas in saccharose, dextrin, galactose, and glycerin. It has no action on the following sugars: Lactose, dulcite, mannite, raffinose, arabinose, adonite, inulin, sorbite, inosite, amygdaline, and isodulcite.

The cultural characters of the fungus, together with those of the same genus previously found in the mouth and intestinal contents of man, are given in the following table. For comparative purposes another table is given in which the cultural characters of all the Monilias so far known are collected. This table, compiled by one of us (A. C.) has already appeared in the *Journal of Clinical Research*.

Presence of the Fungi in the Stools of Sprue Patients.—As already stated, we have found fungi of the genus *Monilia* in seven out of our eight cases. The fungi are generally present in large numbers when the stools are very frothy. In such cases the microscopical examination of a minute portion of the frothy part of the motion may reveal the presence of enormous numbers of spore-like bodies and mycelial elements. There would seem to be an intimate relationship between the reaction of the intestinal contents and the presence of the fungi. We have often observed that by giving very large repeated doses of bicarbonate of soda the fungi apparently disappear, or at least decrease, in amount, and the frothy diarrhœa goes, as well as the feeling of flatulence from which the patients so often complain. It is probable that sodium bicarbonate given in large doses, by removing or decreasing the acidity of the intestinal contents, may check the growth of Monilia fungi which, as one knows, grow far better on acid than on alkaline media.

Fungi found in Normal Individuals and in People suffering from various Diseases.—All the fungi found by us in the stools and in the mouths of sprue patients have also been observed by us in the Tropics in the stools and occasionally in the mouths of normal individuals, as well as in patients suffering from various diseases such as enteric fever.

It is to be noted, however, in our experience, that the finding of fungi in temperate or cold climates is of rare occurrence.

Pathogenicity of the Fungi found.—From some experiments made by us these fungi, provided they are given in moderate amount in food to the lower animals, such as rabbits and monkeys, have apparently no definite pathogenic action. It is interesting to note, however, that rabbits inoculated subcutaneously with cultures of them elaborate agglutinins in their blood and these are to a certain extent specific, namely, the inoculated rabbit develops a distinct amount of agglutinin only for the species with which it has been inoculated.

The intraperitoneal inoculation of massive doses may give rise to an acute purulent inflammation and death. In a case studied a pseudo-tubercular peritonitis resulted.

Conclusions.—From our clinical, pathological, and experimental experiences we can confirm the opinion which we have always held, namely, that fungi are not the real cause of sprue. That there may be secondary hyphomycetic infections, especially in the last stages of the disease, is certain, and that these fungi may play a part in the production of some of the symptoms, such as the frothiness of the stools, is possible. Analogy supports this view. In scabies, for example, the main part of the symptoms is due to a secondary invasion by staphylococci and not to the primary or real cause, the acarus, while in tuberculosis of the lungs the so-called typical serotine fever is not due to the tubercle bacilli, but to secondary streptococcal infections.

If we may express our opinion we believe that sprue will ultimately turn out to be an infectious disease, probably of protozoal origin.

A CASE OF BLACKWATER FEVER SHOWING THE CELL INCLUSIONS OF LEISHMAN.

By Andrew Balfour, C.M.G., M.D., B.Sc., F.R.C.P.E., D.P.H.,
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The following case is chiefly of interest in that I found in the peripheral blood the chlamydozoa-like bodies recently described by Leishman and also because some attempt was made to carry out research upon it by the experimental method, so much neglected in the past and so strongly advocated by Craig [1].

Further, dark field illumination was employed in the examination of the peripheral blood, a procedure not hitherto, I believe, adopted in the disease.

Both for access to the case and for the clinical details I am indebted to the kind courtesy of Captain A. G. Cummins, R.A.M.C., attached to the Egyptian Army.

No. 1723, Nafar (Private) Ibrahim Shalabi, an Egyptian belonging to the Medical Corps, was admitted to the Military Hospital, Khartoum, on December 17, suffering from high fever and vomiting, accompanied by the excretion of a " port wine " urine.

This was the patient's second attack of blackwater, as he had suffered from it at Roseires, on the Blue Nile, in October, 1912.

On recovering, he went on leave to Egypt in November and was ill for about fourteen days when on leave. He returned to the Sudan in December, arriving in Khartoum on December 14. He was taken ill on the night of December 16, at the time when the weather was distinctly cold, dosed himself with quinine and was admitted to hospital on the 17th, as stated. In addition to the symptoms

mentioned, he was restless, had an enlarged spleen, a tender abdomen, and was considerably jaundiced.

I saw the case on this day and about 20 c.c. of blood were taken from a vein in the arm, citrated and inoculated almost immediately into a young *Cercopithecus æthiops* (*sabæus*), which weighed 1.12 kilos, whose temperature was 102.6° F., and whose blood was found to present no apparent abnormality. At the same time wet films were secured for the dark field method and dried films for staining.

It may be said at once that the history of the case was uneventful. The patient was put immediately on Hearsey's treatment, enemata of warm salines were given and hot linseed poultices were applied to the loins.

On December 18, there was little change, the pulse being rapid with a tendency to dicrotism, but fortunately urine was passed in fair quantity. The treatment was continued and the enemata were well retained.

About midday on December 18, the urine began to clear and thereafter the patient rapidly improved, so that on the 20th the perchloride and soda mixture was stopped and the patient given a tonic. Thereafter his complete recovery was only a question of time.

Turning now to the blood examinations, it may be noted that three preparations examined by the dark field method on December 17 showed no abnormality. In one of the stained films in a cell, probably of an endothelial nature, I came across inclusions exactly resembling those described by Leishman [2], and which he suggested might be of a chlamydozoal nature. These are shown in fig. 1, while fig. 2 represents a ruptured "chrome" cell found in another of the films. In none of the films examined, eight in number, were any malarial parasites found, but, as will be remembered, the patient had taken a dose of quinine when he first felt unwell. No other blood parasites were found. I thought it worth while making a differential leucocyte count from one of the films taken on the first day of the illness. The following is the result, 500 cells being counted:—

Eosinophiles	0.4	per cent.
Polymorphonuclears ...	81.2	,,
Large mononuclears ...	11.2	,,
Transitionals	4.2	,,
Large lymphocytes ...	2.2	,,
Small lymphocytes ...	0.4	,,
Basophiles	0.4	,,

The increase of large mononuclears and transitionals, the decrease in eosinophiles and the small number of lymphocytes form noticeable features of the count and point to a malarial condition. So far as one can tell from an ordinary film examination there was a leucocytosis present.

Blood for examination was again taken on December 19, but though three stained films were carefully searched no further inclusions or chrome cells were found. As before, malarial parasites were absent, and there was nothing to indicate a spirochætosis. A normoblast and a megaloblast were found in one of the films, and it seems worth noting that the number of eosinophiles had markedly increased. Possibly this may be looked upon as a favourable omen as regards prognosis in cases uncomplicated by helminthic infection.

The cells containing the special inclusions were like those described by Leishman and the reticular nature of their cytoplasm was well marked. The inclusions themselves closely resembled those originally seen by Leishman, though I did not find the ring forms taking on the deep pink colour of which he speaks. Possibly my specimens were not so well stained. He speaks of them exhibiting a considerable variation in shape and this I also found to be the case, some even resembling little clubs or rods. Like Leishman, I found that cells containing them were not abundant in the blood, though, curiously enough, I, so to speak, stumbled on one after a few minutes' search. Most of them were to be found along one or other edge of the film. I met with no example of the erythrophagocytosis of which he makes mention, but, as stated, a chrome cell was found. As fig. 2 shows very clearly, many of the deep-staining chromatin granules from the ruptured cell were ring shaped and some of them were of comparatively large size. With the unruptured chrome cell one is quite familiar, especially in films coloured deeply by the Giemsa stain.

An examination of several blood films made on December 31, when the patient was convalescent, showed no cell inclusions, but a well-marked eosinophilia was present. There is not much to note about the single animal inoculation performed. The citrated blood was injected subcutaneously, but at no time did the monkey exhibit any sign of illness, nor did its urine become affected.

One point, however, may be mentioned. The animal's blood was frequently examined after the injection, and on every occasion I came across cells like those shown in fig. 3. It will be noticed the appearance is not, at first glance, unlike that of the cells containing Leishman's granules. At the same time there are distinct differences. The granules in the monkey's blood are short, stout rods and are never in a ring form. They stain a little differently to the Leishman granules, being distinctly basophilic and in unruptured cells are arranged in a more regular manner than are the inclusions seen in the blood of blackwater fever cases. After finding them in several films I re-examined my first slides taken at the time the injection was made and I soon found that they existed also in these films. I do not remember having previously seen them in the blood of monkeys, though it is true they are only conspicuous in the case of ruptured cells. It would appear that they are probably normal cell granules in the monkey, at least they have nothing to do with the injection of the blood from the blackwater case. It seems worth while mentioning them as they might be mistaken for Leishman's inclusions by persons carrying out experimental work in this way.

As to the nature of the true inclusions, I see that Schilling-Torgau [8], in a paper just to hand,

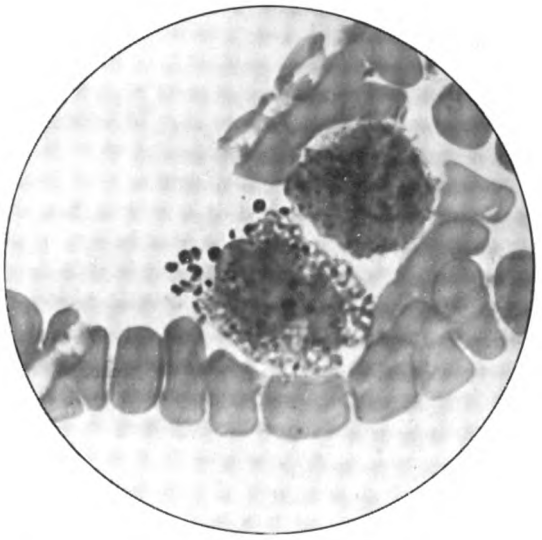

FIG. 1.
Blackwater Fever: Leishman's Cell Inclusions.

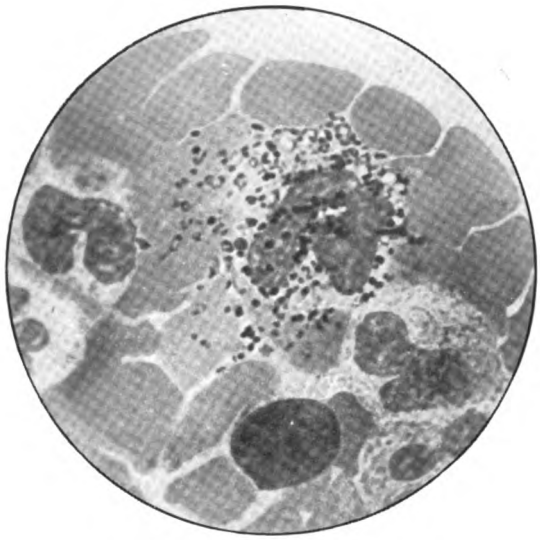

FIG. 2.
Blackwater Fever: Ruptured Chrome Cell.

FIG. 3.
Blood of Inoculated Monkey: Ruptured Cell, showing Short Rods and Granules.

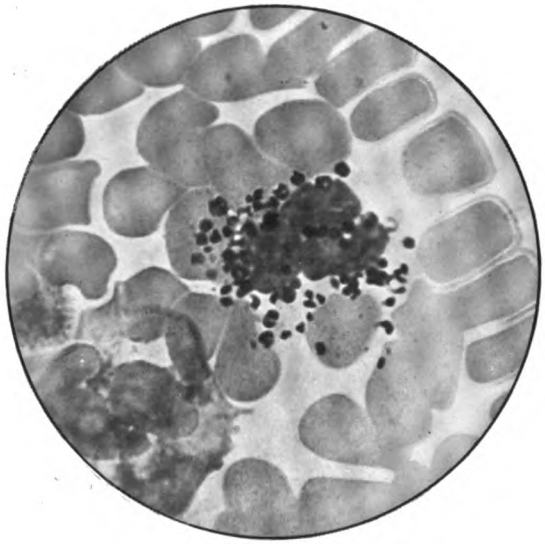

FIG. 4.
Cell Inclusions in Blood of a Malarial Case.

To illustrate a paper on "A Case of Blackwater Fever, showing the Cell Inclusions of Leishman," by ANDREW BALFOUR, C.M.G., M.D., B.Sc., F.R.C.P.E., D.P.H.

says that the larger forms are phagocyted normoblastic nuclei and that the smaller cannot be distinguished from the plasmosomes of Wolf and Ferrata. I did not encounter Leishman's large forms, but I agree that the small granules are very like the plasmosomes which I have figured elsewhere (*Fourth Report Wellcome Tropical Research Laboratories*, vol. A, Plate vi, fig. 3). At the same time these plasmosomes occur in lymphoid mononuclears, while in blackwater the host cells would seem to have an endothelial origin. This, however, does not necessarily disprove Schilling-Torgau's view. When I first read the description given by Leishman, the possibility of their being of spirochætal origin occurred to me, but Sir William Leishman informed me that they did not resemble the spirochætal inclusions in red cells which I have described in Sudanese fowls. Now that I have seen them I am wholly in agreement with this view. The chlamydozoal theory is very interesting and suggestive, but at present, of course, it is nothing more. I have sometimes wondered if blackwater fever might not be the expression of a human spirochætosis. We know that Schaudinn thought yellow fever might be of this nature and due to an ultra-visible form of a spirochæte. Marchoux, Salimbeni and Simond [4] were also of this opinion. Stimson [5] has actually described spirochætes in the kidneys of yellow fever cases, and blackwater and yellow fever are certainly like each other in many ways.

Anthony [6] says he found a spirochæte constantly present in the peripheral blood of 187 cases he examined and he boldly claims it to be the cause of the disease. I confess his brief and emphatic announcement does not impress one and certainly in this relapse case I found no evidence of spirochætal infection, even by the dark-field method.

Harford [7] mentions a distinct association between blackwater and what is still erroneously called "tick fever," and mentions two cases of men who suffered from tick fever in Africa and shortly after returning to England died of blackwater. Here, however, the spirochætal infection may only have acted as a debilitating agent in cases saturated with malaria. It may be of interest to mention that I remember a British officer telling me that a fortnight before contracting blackwater fever in the Bahr-el-Ghazal Province he had been badly bitten on the scrotum by a tick. *Ornithodoros moubata*, however, is not known to occur in the Southern Sudan.

It would not be very difficult to build up some sort of a case for the spirochætal origin of blackwater, but I do not propose to plunge into speculation of this kind, even though Leishman states that such relaxation may occasionally be permitted the weary research worker. It is, perhaps, a pity one did not carry out investigations on a larger scale when a case thus presented itself, but the fact is I had not the necessary time and had the single monkey inoculated shown sign of illness it would then have been possible to perform sub-inoculations.

I doubt very much, however, if blackwater is anything more than the special action of depressing influences exerting themselves along with the malarial toxin and therefore I do not think much is to be gained from the experimental method in this disease. Still it must not be forgotten that what appear to be well-authenticated cases of blackwater fever occurring without any previous malaria, notably, perhaps, that by Rodenwaldt [8] in German East Africa, have from time to time been recorded.

In the light of our present knowledge, however, blackwater fever is more a "symptom complex" than a well-defined disease, so that errors in diagnosis are likely enough to occur.

Until the vexed question of etiology is settled it would appear advisable to employ the Levaditi silver method or one of its modifications in the study of the organs from fatal cases. The use of dark-field illumination or of the Burri method (Harrison's [9] recent modification of which appears likely to be useful) also seems indicated in the study of the blood and tissues in blackwater fever. I would conclude by again thanking Captain Cummins for his courtesy and help.

REFERENCES.

[1] Craig, C. F. (1910). "Is Hæmoglobinuric Fever a Manifestation of Malaria or a Disease *Sui Generis?*" *Collected Papers American Society of Tropical Medicine.*

[2] Leishman, W. (November, 1912). "The Etiology of Blackwater Fever," *Trans. Soc. Trop. Med. and Hyg.*, vi, 1.

[3] Schilling-Torgau, V. (December 16, 1912). "Concerning the Origin and Significance of Leishman's Chrome-Cells in Blackwater Fever (the Basophile Granule Leucocyte of Ehrlich)," Journal of Tropical Medicine and Hygiene.

[4] Marchoux, E., Salimbini, I., and Simond, P. N. (November, 1903). Report of French Mission at Rio, *Ann. de l'Inst. Past.*

[5] Stimson, A. M. (December 1909). "Notes on Stimson's Spirochæte found in the Kidney of a Yellow Fever Case," *Trans. Soc. Trop. Med. and Hyg.*

[6] Anthony, C. (November 18, 1911). "Infectious Diseases amongst Negroes," *Brit. Med. Journ.*

[7] Harford, C. F. In discussion on Leishman's paper (*loc. cit.*)

[8] Rodenwaldt, E. (November, 1910). "Schwarzwasserfieber ohne Malariafieberanfall," quoted in *Archiv. f. Schiffs und Trop. Hyg.*, xv, ii, 1911.

[9] Harrison, L. W. (November 30, 1912). "A Modification of the Burri Method of Demonstrating the *Spirochæta pallida*," *Brit. Med. Journ.*

Note.

Very shortly after completing this paper I received for examination the blood of a British officer who had recently returned to Khartoum from Roseires, on the Blue Nile, a notoriously malarial station where blackwater fever is known to occur.

The officer in question was suffering from a fairly severe attack of fever, and had dosed himself with quinine. He had no symptoms of blackwater and no malarial parasites were found in his blood, but I discovered the fine example of cell inclusions shown in fig. 4. There was a marked increase of large mononuclear leucocytes. The patient recovered without any untoward symptoms.

In thinking over matters, I have been wondering if we may not be on the wrong tack looking for parasites in blackwater fever. Is it not possible that some biting insect may introduce into the blood stream a toxin in the shape of a powerful

hæmolysin? That some insects do contain hæmolysins we know, and it is conceivable that such might be injected and, acting on red corpuscles already predisposed to hæmolysis, through the influence of malaria, or some other debilitating condition, induce the state of things encountered in blackwater fever. Considering how small a quantity of any such toxin would probably be injected it is perhaps difficult to conceive of its possessing such potency, but the final effect might only follow several injections, or repeated injections; while it is possible the virulence of the hæmolytic toxin might be heightened after introduction into the human body, perhaps only after a lengthy period. I fear I am now in the happy realms of speculation, but put forward the suggestion as one which would meet many difficulties and which, for all we know to the contrary, may have a basis of truth. When we remember how profoundly the toxins of *Agchylostoma duodenale*, in all probability, affect the state of the blood it is perhaps not asking too much to request consideration of the above-mentioned hypothesis, which, so far as I know, has not been hitherto advanced.

Sand-fly Fever.—From June to September, 1912, 161 cases of sand-fly fever and 112 cases of malaria were admitted to the Military Hospital, Parchinai. Capt. E. C. Taylor, I.M.S., and M. H. Khan, Assistant Surgeon, give an interesting account of these cases in the *Indian Medical Gazette*, December, 1912. The authors use the term "sand-fly fever" as opposed to "three-day fever," for the period of pyrexia in 161 cases was as follows: One day, 73; two days, 55; three days, 24; four days or more, 9.

Three notable features of sand-fly fever are pointed out by the authors:—

(1) Complaint of very severe body pains.
(2) Presence of catarrhal signs.
(3) Slow pulse.

In differentiating from malaria one may note that in sand-fly fever the patient complains of severe pains and not of fever. In malaria their answer to the question "What is the matter with you?" is "I have fever," not "I have pains."

As to the catarrh, the first cases were isolated under suspicion of being "early measles." The face is red, eyes suffused, fauces injected. There is well-marked, angry-looking injection of the soft palate clearly dividing this from the uninjected mucous membrane over the hard palate.

In malaria the patient though flushed and with red eyes during the paroxysm will next morning be pale, with clear fauces and palate, and though his temperature be nearly normal his pulse-rate is generally over 100. In cases of sand-fly fever with temperature of over 100, the pulse-rate rarely exceeded 100; and next morning when the temperature would be over 100, the pulse would be between 80 and 90, and soon drops to 60 or 70.

The presence or absence of an enlarged spleen gives little help; because there is nothing to prevent the subject getting sand-fly infection, even though his spleen is enlarged as a result of malaria.

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OPIUM SMOKING BY THE CHINESE.

AT the present moment the opium question, in its financial and political aspect, occupies a prominent place in the public eye. Opium from India in huge quantities, in value some £12,000,000, is said to be in the hands of merchants engaged in the China trade, and the question of the loss thereby threatened is in danger of becoming an international one. The reason why the opium chests have accumulated in the treaty ports of China is due to one of two causes: either the Chinese have ceased to smoke opium and require neither the imported opium from India nor the home-grown Chinese product, or the Chinese are continuing to smoke opium and are being supplied, not with the imported, but with the home-grown drug. The crux of the question from a political standpoint turns, therefore, on whether the Chinese are continuing to smoke the opium produced in China or not.

If it is the case that the Chinese have ceased to smoke opium everyone will rejoice, and none more so than the medical missionaries in China, who have continued to preach of the evils consequent upon opium smoking. Even in pre-republican times the people of China were so well in hand, that had the

authorities wished to do so an edict from the throne would have stopped opium smoking within a month. Such an order, however, was not forthcoming; and if not, why not? Either the authorities did not consider opium smoking severely detrimental to the public health of the community, or for financial or political reasons an edict of the kind was inexpedient. Now we are given to understand opium smoking is forbidden by law, therefore opium in any form, imported or home-grown, is contraband.

This sudden conversion, if conversion it is, to a high sense of public morality and super-sanitary state is most interesting; and in view of such a sudden change one is asked, from a medical point of view, whether the sudden stoppage of opium smoking to one habituated to the use of the drug is detrimental in any sense. In a general way the answer is: No! it is not detrimental to suddenly leave off opium smoking. A prisoner habitually addicted to opium, when sent to gaol and suddenly deprived of the drug, is not placed in any danger in a physiological sense, and nothing but good results as far as the general health is concerned ensue. The smoker's mental state is another thing, and without compulsory isolation, as in gaol, it is doubtful if anyone inured to the use of opium for years has ever had sufficient courage or self-control to suddenly stop the practice. It is, therefore, theoretically sound legislation from a public health point of view that if the opium smoker is to be cured he should be prevented getting opium altogether, for it is only by forcible withdrawal that the custom can be checked.

There is another aspect, however, of the use of opium in China, independent of the mere debauch point of view. As a medicine in chest complaints, and in fever from every cause, it is widely used. In asthma, emphysema, chronic bronchitis, and in tubercular disease of the lungs, opium is smoked or eaten as a means of allaying cough. The writer has never seen an opium smoker in China who had not some disease of the respiratory organs; this, however, is nothing to go by as far as the prevalence of the habit goes, for as a doctor the writer was not likely to see opium smokers who were not affected by some form of illness. Still, there is the fact, and it is a question whether the habit engendered the disease, or the disease determined the habit. The latter would appear the more probable, and moreover, the continuance of the use of opium seems to have some restraint upon the advance of pulmonary tuberculosis once it is established. Certain it is that, with a tubercular affection of the lung which seemed to be universal, the opium smoker appeared to live on far beyond a period that the severity and extent of the infection would seem to render possible. That opium is a curative agent in consumption cannot be entertained, but that it delays the rapidity of its advance would seem highly probable.

In fever of all kinds opium is used in China. In malaria we know that it was used in England for ague, which prevailed so extensively and persistently throughout the South-Eastern counties and in the fen countries until the middle of the last century. The fever powder in use in England, and handed over to the farmers when they asked for ague powders when they journeyed to market, consisted of opium, arsenic, and quinine or powdered cinchona bark. The powder was given after a mercurial purge had been administered, so that malaria was treated by our immediate predecessors not by mere quinine, but by four of the most potent drugs known—namely, mercury, opium, arsenic and quinine. One specific drug for each specific disease was not in vogue in those days, and recent investigations have shown that two or more potent drugs are necessary before the blood parasites can be reached and destroyed. But there were fever mixtures long before quinine and cinchona bark were known, and in these opium was ever present. The well-known "fever" tincture was used for some 4,000 years before Dr. Warburg, of Vienna, added yet another drug—quinine—to the twenty-two drugs already present. The use of opium, therefore, in China will continue for many a day; it will be used more extensively in China than in any other country, not only from the mere fact of the enormous population, but because a far larger per cent. of the population use opium in cases of illness than in any other country in the world. The quantity of opium required in China will therefore continue to be large, and whether grown at home or imported is not a matter of consequence from a purely medical point of view, but financially it means a great deal to the merchant. If the Chinese have stopped the cultivation of the poppy, then as it is a medicine which is used as a household remedy for many ailments amongst the 400,000,000 of people inhabiting China, a large quantity must be imported to supply the legitimate demand of the country. On the other hand, if the importation of opium from India ceases, it need not imply bad faith on the part of the Chinese if they continue to cultivate the poppy, for the just medicinal demands must be satisfied, and it is shown above that this is large.

At the present time the Chinese newspapers are asking why are not the missionaries speaking out upon the subject and helping them in their demand that the foreign importation be arrested. The answer is: that the missionaries have already done their part; it is due to the foreign missionaries that even the Chinese authorities know how widely spread the use of the drug in China is; they have by lectures, at public meetings, in their reports, and in the newspapers time and again, and for years, dealt with the subject, and they have succeeded in rousing public opinion on the matter both in Britain and in China. It is the missionaries we have to thank for a serious attempt to enable China to get rid of a deadly trammel to her welfare and advance.

MR. AUSTEN CHAMBERLAIN has received £200 from the Suez Canal Company towards the sum of £100,000 he is raising for the London School of Tropical Medicine. The fund now amounts to £45,000.

Annotations.

The Health of the Canal Zone.—Gorgas, reporting on the Health of the Canal Zone for the month of October, 1912, states that the total number of deaths from all causes among employees was thirty-eight, divided as follows: Disease 28 and violence 10, giving the annual average per thousand of 6.71 and 2.39 respectively.

Among employees for the month of October of each year the annual average death-rate per thousand was as follows: 1904, 20.31; 1905, 32.85; 1906, 46.68; 1907, 25.97; 1908, 12.93; 1909, 9.95; 1910, 10.19; 1911, 11.08; 1912, 9.10.

The annual average death-rate per thousand in the cities of Panama and Colon and the Canal Zone, including both employees and civil population, for the month of October of each year was as follows: 1905, 56.62; 1906, 46.40; 1907, 30.19; 1908, 27.91; 1909, 16.62; 1910, 23.61; 1911, 21.35; 1912, 23.08.

In segregating according to race, the annual average death-rate per thousand from disease among employees was: For whites 3.84 and for blacks 7.66, giving a general average for disease of 6.71. For the same month during 1910 the annual average death-rate per thousand from disease among whites was 4.51 and blacks 5.98, giving a general average of 5.58; and in 1911 from disease among whites 4.87 and blacks 10.56, giving a general average of 9.15.

Among employees during the month deaths from the principal diseases were as follows: Cirrhosis of liver, 1; lobar pneumonia, 4; malaria fever, æstivo-autumnal, 1; tuberculosis, 8; leaving 14 deaths from all other diseases and 10 deaths from external violence.

No cases of yellow fever, small-pox, or plague originated on or were brought to the Isthmus during the month.

Cholera Vibrios in the Biliary Passages.—Major Greig, I.M.S., in the *Lancet* of November 23, 1912, describes the occurrence of cholera vibrios in the biliary passages. He gives details of the clinical notes and *post-mortem* examination of the case in which this important observation was made. The case presented several interesting and suggestive features: (1) After the acute phase the patient lived for twelve days, dying from uræmia. (2) The presence of cholera vibrios in the bile and the pathological changes in the gall-bladder. (3) The presence of the organisms in a consolidated area in the lung also. (4) The pathological investigations indicated that the changes found in the organs were the result of toxic action, the origin of this poison being probably the cholera vibrio growing in the bile. It would appear that as the vibrios die the intracellular toxin is liberated and passes into the system. (5) The pathological changes in the cæcum closely resembled the condition found in the large intestine of rabbits after subcutaneous or intravenous injection of Shiga's bacillus. From a consideration of these facts Greig believes that it will be necessary to revise the present conception of the distribution of the cholera vibrio in the tissues of man, and this revision may help to clear up certain unexplained problems connected with cholera.

Bilharziasis in Australia.—Nelson, writing in the *Australian Medical Gazette* of November 9, 1912 (No. 408, vol. xxxii, No. 19), describes three cases of Bilharzial infection. Two of these cases, one a woman, the other a man, had never been out of Australia, so this means the disease has been introduced into that country.

The woman lived at a timber mill, where an ex-soldier from the Transvaal, suffering from bilharzial disease, acted as a storeman. She undoubtedly then had contracted the disease from him, but in what way it is difficult to say, as bathing facilities were *nil*, rain water was used for drinking, and the pipe water for the mill was pumped from a place over a hill a mile away. Nelson thinks that the infected man might have contaminated the bread he handled, with his fingers soiled with urine, as he had to micturate almost every half hour. The other indigenous case was a West Australian male, aged 21, who had never been out of West Australia. He lived twelve miles away from the timber mill, but the contour of the country made it impossible for any drainage to come from there. He had once been, for a period of two weeks, at the mill more than a year before the onset of his first symptoms, so any connection betwen the two cases is not by any means clear. His occupation was a platelayer, and Nelson thinks he may have got his infection from the flushing of a lavatory car used by a person suffering from the disease. The recurrence of such cases is a serious menace to Australia, and the Central Board of Health has now made such cases notifiable. In this way it will soon be ascertained if the infection is widespread or not.

Demonstration of the Treponema pallidum.—In the *Journal of the Royal Army Medical Corps* for December, 1912, Major Harrison describes a modification of the Burri method of demonstrating the *Spirochæta pallida*. The method in his own words is as follows:—

A disadvantage of Chinese ink for demonstrating *Spirochæta pallida* is that unless it is prepared by centrifugalization or, as Captain Frost has recommended, by the addition of tincture of iodine, the field is too granular to make the detection of *S. pallida* at all easy.

Major Harrison has found that a more homogeneous field is easily obtained by substituting for Chinese ink a a suspension of collargol. The suspension is prepared according to the directions of the makers (Chemische Fabrik von Heyden), one part of the powder being made up with nineteen parts of distilled water. The powder is first put into a black bottle (or an ordinary bottle wrapped round with black paper) and the distilled water poured on it. After standing for a few minutes the bottle is well shaken and again

allowed to stand, it is shaken again and is then ready for use. The suspension is used exactly as if it were Chinese ink, a loopful of the suspected serum and one of collargol being mixed together at one end of a microscope slide and then spread like a blood-film.

The film may be examined with an oil-immersion lens as soon as it is dry; spirochætes appear white on a reddish-brown field which is almost perfectly homogeneous. The examination requires a fairly good light, but good daylight is sufficient.

As a diagnostic measure this method of demonstrating *S. pallida* has the same disadvantages as the Chinese ink, the chief of these being loss of the characteristic movements of the spirochæta. Under dark-ground illumination extremely delicate spirochætes may be seen in the secretion obtained from the surface of sores which were non-syphilitic. Major Harrison therefore strongly urges that particular care be taken to clean the sore beforehand so as to prevent surface organisms from contaminating the exudate from the deeper layers.

Primary Splenomegaly.—Mandlebaum, in the *Journal of Experimental Medicine* for December 1, 1912 (vol. xvi, No. 6), describes a case of primary splenomegaly.

As a result of his studies he states that primary splenomegaly of the Gaucher type is a distinct disease, related in all probability to the blood diseases. It begins usually at an early age, frequently affects several members of a family, and runs a chronic course.

The clinical manifestations are: pronounced hypertrophy of the spleen, subsequent enlargement of the liver, absence of palpable lymph nodes, absence of jaundice and ascites, absence of characteristic blood changes, discoloration or pigmentation of the skin, and a tendency to epistaxis or other hæmorrhages.

The lesions are found in the spleen, lymph nodes, bone marrow, and liver. These organs show the presence of iron-containing pigment, and large multinuclear cells with a characteristic cytoplasm. In the early cases peculiar large phagocytic cells arising from atypical large lymphocytes are found in the follicles of the hæmopoietic system. After leaving the follicles these cells possess phagocytic qualities for a certain period. As a result of the phagocytosis the cells enlarge, the nature of the cytoplasm changes, and the cells acquire a characteristic vacuolated and wrinkled appearance. The cells are carried from the spleen through the portal system to the liver, where they are destroyed. The irritation produced by this destructive process gives rise to an increase in the intralobular connective tissue.

The disease is eminently a chronic one, without any of the manifestations of malignancy, and always terminating as the result of some intercurrent affection.

The etiology is unknown, although a family predisposition to some toxic agent which causes an irritability of the follicles in the hæmopoietic system probably exists. The possibility of some protozoan infection as an etiological factor must not be overlooked.

Malaria in the Andamans.—S. R. Christophers in "The Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India" (New series, No. 56) writes on malaria in the Andamans. He believes that his observations enable him to draw some very definite conclusions as regards the disease in those parts.

The chief carrier of malaria in the Settlement is the *Nyssomyzomyia ludlowi*, he states, a species which breeds in and about salt swamps, and was not found at a greater distance from salt or brackish water than half a mile.

The species of parasite proved to be carried by this anopheles was malignant tertian. It is probable, as happens with other species, that it carries all forms of the parasite.

Whether any part is taken in the transmission of malaria by the other common species, *Nsm. rossi* and *Myzorhynchus barbirostris*, is doubtful. In any case, the latter species could only be an important carrier within the forest. The mere clearing of the land has made it unimportant even in regard to numbers.

Owing to the distribution of *Nsm. ludlowi*, malaria in the Settlement is confined to a belt around the margins of the harbour, and is absent, or nearly so, from villages more than half a mile from the sea coast or the salt swamps associated with it. This freedom from malaria is seen even in inland villages situated on the margins of swamps, amidst rice-fields, and near jungle.

In the case of some villages malaria was found in the portions lying nearest the sea, but not in the inland portions.

The endemicity even within the malaria belt is not strikingly high, and only one large village (Port Mouat) showed a spleen rate of over 50 per cent. This moderate endemicity is associated with a moderate prevalence only of anopheles. Suitable conditions for breeding were unlimited, but fish of the genus *Haplochilus* were very common, and were found in all waters but those of a very temporary nature.

The predominating type of parasite among the children in the villages was simple tertian. Among convicts admitted to hospital and among the convalescent gang, quartan infections formed 50 per cent. or over. The carrier was the same, and there is little reason to doubt that the quartan parasite predominated in the case of the labouring convicts because circumstances favoured relapses, whilst actual transmission of the disease was not very active.

It is interesting to note that though infection with malignant tertian at the time of Christophers' visit was very little in evidence, yet the only two infected anopheles encountered were infected with this type of parasite.

There is some reason to believe, he thinks, that proportionate prevalence of the different forms of parasites in any community is dependent upon (*a*) activity of transmission (numbers of anopheles carriers); (*b*) factors increasing or diminishing the number and continuance of relapses.

Malignant tertian (producing gametes) most abundantly increases whenever transmission is

active, *i.e.*, the numbers of anopheles are high. Quartan, producing few gametes but peculiarly prone to relapse and to remain for long periods in the blood, relatively increases when transmission is low, but factors favouring relapse high. Simple tertian is an intermediate form able to assert itself most when transmission is moderate and the antagonism to relapses not too high (native children as against well-fed Europeans who suffer most from malignant tertian due to fresh infection).

It remains to be seen, he thinks, whether the frequency of relapses at different periods after the original infection does not differ in the case of different parasites, still further enabling one to explain the prevalence of different species of parasite under any given conditions.

Fistulous Diseases of the Buttocks: A Clinical Entity.—In a paper read before the Society of Tropical Medicine and Hygiene in December, 1912, Dr. James L. Maxwell writes that in South Formosa and South China a disease of some rarity is met with, the cardinal symptom of which is the spread of deep fistulous tracks throughout the subcutaneous tissues of the buttocks in all directions.

The disease is a rare one; only one or two cases in a year are seen at the Tainan Hospital, with an in-patient list of about 2,700 patients a year, and an out-patient clinic of twice that number. The disease is said by the patients to commence with an apparently ordinary fistula in ano, a complaint very common there, but it differs from this in being almost painless. From the original fistula, fistulous tracks spread in all directions over both buttocks, till the whole surface is outlined by a maze of tracks, communicating with each other, and marked on the surface by raised and indurated lines, opening here and there by small pinholes, which discharge a serous pus. The actual pain is very slight, but the discomfort in sitting is sometimes marked. Owing to the lack of actual pain, the patients are long in seeking treatment, and the cases he had seen had lasted from one to five or more years. Treatment proves most unsatisfactory. Slitting up and scraping the sinuses seemed to be of but little permanent value, and the radical excision of the whole of the affected tissues was impossible, owing to the large areas involved.

For the last ten years he had been seeking some pathological explanation of these cases. He was satisfied that they are not pathologically connected with the ordinary fistula in ano, which yields very satisfactory results to the ordinary surgical treatment. One's first idea of a chronic disease of this nature was to refer it to the parasites of syphilis or tubercle. The cases have, as a rule, no specific history, however, and they do not improve in the least on anti-syphilitic treatment; nor does microscopic examination of sections of the tissues confirm the suggestion that the disease might be syphilitic.

Tuberculous fistulæ round the rectum is a well-known disease. Dr. Maxwell's experience was that in advanced cases these were very painful; that the fistulous tracks tended to spread deeply in the ischio rectal fossa, and that there was a complete absence of the massive induration that is characteristic of the cases under discussion. Further, microscopical examination entirely negatived any suggestion of tuberculosis.

When in England, a few years ago, he asked Sir Patrick Manson to suggest the cause of the condition, and his advice was to be on the look-out for a mycotic parasite as the causal agent. Dr. Maxwell had tried to do this since returning to Formosa, but with negative results. He wished to state quite clearly that he did not think this was at all sufficient proof of the absence of such a parasite. Some of these micro-organisms, such as those of actinomycosis and madura foot, were easily recognized, and he was certain that they were absent from the cases. Others, such as the germ of sporotrichosis can be determined only by their development on culture media, and both lack of time and lack of apparatus made it impossible for him to engage in such an investigation.

Since he began to regularly examine the pus from the sinuses, he had found, in all of the few cases that came to hospital, the presence, and that in large numbers, of amœbæ, conforming he believed to the type of *Entamœba histolytica;* and he threw out the suggestion for further investigation, that the disease was due to the entrance of these amœbæ into the tissues, possibly from an original simple fistula in ano.

The following points were in favour of such a suggestion:—

(1) Anything like this condition had never been seen by him in any other portion of the body surface, and this suggested the probability that the position of the rectum and anus had some causal relation with the disease, as for example in conveying the causal agent to the site indicated.

(2) The known character of the amœbæ in the colon to form chronic sinuses, burrowing beneath the mucous membrane.

(3) The chronic and relatively painless nature of the disease.

(4) The absence of any suggestion of syphilis or tubercle in these cases.

Dr. Maxwell wished definitely to claim for the disease a separate clinical entity. With some hesitation he suggested that the causal agent was the *Entamœba histolytica.*

The cases were rare, his time and apparatus very limited, and he desired that others more qualified to speak on the problems raised should have their attention drawn to this disease.

In the discussion that followed Dr. Maxwell's paper, Dr. Aldo Castellani pointed out that Kartulis had described an apparently identical disease in Egypt. Furthermore Dr. Castellani had seen similar cases in Ceylon, and from the lesions, in every case, he had been able to isolate a blastomyces which he considered to be the causal agent of the disease.

Dr. C. M. Wenyon stated that the mere finding of amœbæ in discharges did not prove their causal relation to the disease, for amœbæ could easily have wandered into the sinuses from the gut; especially so when one remembered that as many as 60 per cent. of the healthy population harboured such parasites in their gut.

Reprint.

INJURIES AND DISEASES OF MAN IN AUSTRALIA ATTRIBUTABLE TO ANIMALS (EXCEPT INSECTS).*

By J. Burton Cleland, M.D., Ch.M.(Syd.).
Government Bureau of Microbiology, Sydney.

(*Continued from p.* 31.)

Phylum Arthropoda.

Class Arachnida. Order Acarina.

Injuries by Mites.—Mites are of interest from the irritation and annoyance produced by them when they burrow into the skin. The acarus of scabies (*Sarcoptes scabei*) has been found in most of the capitals of Australia producing the itch. The first reference to it that I can find is by Dr. Thomas in South Australia (*A.M.G.*, December, 1884, p. 65). A few years ago Dr. Cumpston, of West Australia, reported the presence of a case in a school child in Perth, and since then he has found a few more cases.

In the tropical parts of Queensland, a small red mite, *Leptus* sp., causes great misery. S. W. Jackson, writing in the ornithological journal *The Emu*, vol. viii, June, 1909, thus describes the attacks of these acarids in the Tinaroo scrubs near Atherton, North Queensland, at the end of October, 1908:—

"October 31. In patient silence we waited, enduring absolute torture from the bites of the red scrub animalcule (*Leptus* sp.), irritating parasites that can give points to all ticks, sand-flies and mosquitoes in the world" (page 249). "November 1. One pays, however, for the privilege of these scrub wanderings. The coin current in this case was the endurance of that awful 'scrub-itch,' and I was glad to get back to camp to ease the ceaseless irritation, which was getting my legs into a really horrible state" (page 257). November 2. The scrub-itch mites, tiny red parasites hardly visible to the naked eye, punished me severely again today; they mostly attack the legs below the knees, and quickly reduce them to a raw state of intense irritation, which was bad enough to make sleep quite impossible, and I found on enquiry that the aboriginals suffer to a similar degree" (page 252). "Next day, between the severe scalding sting of the giant nettle-tree and the countless bites of the scrub-itch mites," Mr. Jackson found it necessary not to venture into the scrubs lest blood-poisoning should ensue.

Various Gamasid mites from time to time reach human beings from other hosts. Several Australian instances have come under my notice.

Gamasids from Rats.—Recently in Adelaide, the employees of a manufacturing stationer were much bothered by small mites getting on to their persons and finding their way to hairy parts, especially the pudenda. Here they produced intense irritation, necessitating immediate retirement to the lavatory, where the small mites were detected. These were forwarded to the Adelaide Museum, where Mr. Robert Zietz detected their nature and, on making further enquiries, was led to suspect rats as the normal hosts. It was then ascertained that these, *Mus decumanus*, were present in large numbers, even nesting amongst old papers. In such situations mites were in abundance and easily crawled on to those turning over the litter. From one such nest containing young rats, a large number of mites were obtained, which Dr. Stirling, of the Museum, referred to my colleague, Dr. T. Harvey Johnston, for identification. He found that in character they closely approximated to *Lælaps agilis*, though differing slightly in the shape of the body and in the character of the bristles.

Gamasids from Fowls.—Gamasids, probably *Dermanyssus avium*, sometimes pass from fowls and chickens to persons handling them, when the irritation they cause produces a rash. An instance of this at Port Pirie, in South Australia, has been mentioned to me, and doubtless many others have occurred.

Gamasids from Starlings.—In Sydney, it has been reported that in some cases, where English starlings have built in the roof, the dwellers in the house have suffered much irritation from mites introduced by the birds. In one case, in a church, it is said that the roof had to be renovated on account of the annoyance caused to the congregation by these creatures. The mites, Dr. T. Harvey Johnston tells me, may prove the same as the one on fowls.

Human Infestation by Ticks.

Along the Eastern Coast of Australia in parts where there are dense scrubs and tropical jungle, it is not at all uncommon at certain times of the year to find that ticks (*Ixodes holocyclus*) attach themselves to the human subject. As a rule, beyond some irritation, they produce no particular ill-effects, but every now and again a case is reported, usually in children, in which severe symptoms have followed and sometimes even death. Not only are human beings affected, but dogs are especially liable to suffer from the effects of these creatures, and pigs are also said to die from their bites. The first reference that I can find to human infection by these animals is an article entitled "Queensland Ticks and Tick Blindness," by Dr. Joseph Bancroft, of Queensland, in the *Australasian Medical Gazette* for November, 1884.

Dr. Bancroft says that these Queensland ticks frequently kill dogs and cats, though native animals endure them without much injury. The ticks generally seize upon the soft folds of the skin about the neck and ears of dogs, and in man about the neck, groin, and armpit. In attaching themselves they produce little pain and are rarely noticed, but shortly afterwards a small inflamed point results, suggestive of a small boil. He says that persons familiar with the tick can tell by the peculiarity of the pain when the inflamed point is touched that

* Reprinted from the *Australasian Medical Gazette* of September 14 and 21, 1912, by permission of the proprietors.

he is suffering from tick-bite. Swelling of the surrounding tissues may nearly bury the tick. He gives an instance in which he removed a tick from a man after it had been attached a fortnight. It was ½ in. long and had caused considerable pain and swelling of the neck, together with a sense of debility.

Dogs with long hair, Dr. Bancroft found, are especially liable to contract ticks, which attach themselves most often about the neck and other parts the dog cannot reach with its teeth. In puppies when once tick poisoning presents itself he had never seen recovery. In full-grown dogs, in two or three days after the attachment the dog begins to look weary. In cats through not washing themselves they appear dirty; food is refused and soon after drink. The animal lies down and crawls away where he can remain undisturbed. Puppies travel away and are rarely again found alive. Weakness in the hind legs is first observed, and in about five days from the attachment of the tick the animal becomes unable to walk, and may at times be found to become timid and delirious. On attempting to rise on his fore feet he may fall over insensible, but in a few minutes recovers his consciousness. During one of these attacks it will be seen that the lips of the dog are pale, his heart can scarcely be felt to beat, and the condition of fainting is clearly noticeable. During the illness there is the greatest reluctance to take food or drink. Forcible feeding brings on the fainting attacks, and a few days later he dies in one of the attacks, though dogs live much longer than puppies. If the tick has been removed early, recovery may occur. In the only cat Dr. Bancroft has seen affected, the animal was unable to walk for a week. After forcibly feeding with milk, slow recovery was made. The cause of death appears to be chiefly due to muscular paralysis. The muscles most remote from the centre of circulation suffered most, for instance, the hind legs first, the fore legs next, and lastly the heart. Animals in an infected country become tick-proof.

Tick Blindness in Man.

Dr. Bancroft has seen a case of a married woman, about 40, who came with a tick attached to the skin near the ear. She complained of weakness, and a fear of falling on stooping or erecting herself. The tick was removed. She could not distinguish persons in the distance, and could only read half-inch type with difficulty. The iris moved correctly; there was no pain or inflammation of the eye; the accommodation was normal and the amblyopia was the only error noticed. The other nervous defects disappeared in about a fortnight, after which her sight gradually improved, and in a month she could read ordinary newspaper type.

The next note occurs in Professor T. P. Anderson Stuart's Anniversary Address* to the Royal Society of New South Wales in May, 1894. Professor Stuart refers to the frequency of animals being infested with ticks in the neighbourhood of Sydney. He summarizes observations of about a hundred cases in dogs collected from the letters of his correspondents as follows:—

"Young animals are especially susceptible. There is first moping, hot nose and gradually advancing muscular weakness first noted in the hind limbs from the staggering gait, then in the fore limbs and muscles of respiration. Probably owing to the last mainly is a great diminution of the animal's activity and an alteration of its bark, which becomes rather a gruff cough. Obstinate constipation, and troubles of micturition or retention are noticed. Epileptiform attacks or prolonged convulsions may usher in a fatal issue, or there may be no convulsive sign and death ensue from heart failure, the pulse having been flickering, or from failure of respiration, preceded perhaps by Cheyne-Stokes breathing. Peripheral nerve paralysis has been seen during convalescence. The tick when filled with blood falls off and leaves a hard lump which does not disappear for two or three weeks. One attack confers immunity. Some of the ticks are comparatively harmless, some, such as the "bottle tick," a single one of which killed a dog of 40 lb. weight, are very venomous."

Death of a Little Girl from Tick-bite.

The following interesting account of the death of a child following upon tick-bite has been very kindly communicated to us by Dr. G. B. Douglas Macdonald, of Eden. The tick was almost certainly *Ixodes holocyclus*.

"A little girl, aged 13 months, living near Eden, on the south coast of New South Wales, became ill on November 21, 1909. The father and some of his men had gone for a walk through thickly timbered land, their clothes brushing against the scrub, which was in parts infested with bottle ticks. On returning home the child met them and was carried, being handed from one to the other. It is supposed that a bottle tick must have crawled off the clothes of one of them on to the child. Towards evening she appeared restless and finally so much so that the mother merely sponged the child's body rather than worry her with her evening bath. As she seemed sensitive about having her head touched her mother did not brush out her long thick curls. All that night she was very restless and tossed about, and the next day seemed too listless to stand, but lay in her mother's arms. On the 23rd the grandmother found a bottle tick behind the left ear just above the mastoid process; its size distended with blood was ½ in. by ⅜ in. After rubbing in some kerosene it was pulled off and crushed on the floor. Dr. Macdonald saw her about 6.45 p.m. on the 23rd; the child was restlessly moving her head and arms about, but never put her hand to her ear. She kept whining and moaning; her temperature was 101.6°, and the pulse 140; the respirations were hurried and shallow; she had a cough and tried to bring up mucus but found great difficulty in doing so. She did not seem to have strength enough to cough, but appeared to be

* *Journal of the Royal Society of New South Wales*, vol. xxviii, 1894, p. 10.

partially paralysed. The legs did not move during all the time of examination. At the site of the tick-bite was a circular redness about 1 in. in diameter, with a small purple spot ⅛ in. in diameter in the centre. After treatment, in four hours she seemed to get slightly better, her temperature fell to 99°, the pulse to 120°. The respirations had considerably improved. At 11 p.m. Dr. Macdonald left, but heard afterwards that she continued to improve until 3 a.m., when she suddenly collapsed and, failing to cough up the mucus which had collected, she sank and died about 3.30 a.m.

The treatment adopted was to incise and curette the poisoned place at once, rubbing in some potassium permanganate; strychnine and digitaline were given to increase the heart's strength and to reduce its frequency, and an enema was administered and also a little hyd. subchlor. Vin ipecac. was given to cause vomiting and bring up the mucus, but did not have the desired effect, and so a sterilized feather was used and this resulted in large quantities of mucus being expelled. The child also had spt. amm. arom. and brandy as a stimulant. These measures seemed to greatly relieve her. In the opinion of Dr. Macdonald, death was caused by paralysis affecting especially the respiratory tract. An hour after the patient was dead, purplish *post-mortem* discolorations were marked along the back of the hind part of the legs.

Dr. G. O'Neill has given me the following account of a patient of his who was heavily infested by these ticks at Middle Harbour, Sydney. Over 200 were removed from the trunk, legs, arms and neck. Symptoms of faintness were noticed within about an hour after the ticks had fastened on. He was seen by a medical man within four hours and showed then extreme collapse and weak cardiac action with syncope. There was no local irritation. The patient was very ill for a week with cardiac symptoms, but no paralysis. The ticks were of various sizes, the smallest being that of a grain of wheat, and were removed with difficulty.

Spiders.

The small black spider with the red spot, known as *Latrodectus hasseltii*, can give rise to a very dangerous bite in human beings. This species, or varieties of it, is found in Australia, New Zealand, India, Africa, &c., and the animal is given the name of Katipo in New Zealand. It lurks in dark places, such as under seats of dark closets in country houses, under boxes, stones, &c. Most instances of biting appear to have occurred in people who have visited closets at night-time. In Australian literature there are some ten references to cases of bites by these spiders.

Scorpions.

The only reference to stings by scorpions that I possess is one in Colonel Warburton's Journal of his Explorations (p. 286), under date December 23, 1873, the locality being on the Oakover River in Western Australia. He states that the camp "is infested with scorpions, which is unpleasant, as we all go about barefooted," and that Sahleh (one of the Afghans) "has lost the use of one hand and arm from the stroke of a scorpion."

Crustaceans.

As in other parts of the world, cases of urticaria, following the eating of lobsters, are well known in Australia.

Phylum Annulata.

Hirudinea.—Leeches are abundant in many parts of Australia, and at once suck human blood when opportunity offers. According to Dr. T. B. Wilson ("Narrative of a Voyage Round the World," 1835, p. 259), the natives near King George's Sound always exercise great care when drinking water in which leeches are present, lest these creatures enter the mouth with the water, which nevertheless they occasionally do with fatal consequences. The leech would, probably, gain attachment to some part of the pharynx or even the œsophagus or stomach, where it might cause mechanical trouble at once or after engorgement, or death might on the other hand result from uncontrollable hæmorrhage after its removal.

Phylum Echinodermata.

Holothuroidea (*Bêche-de-mer*).—Banfield mentions an outbreak of poisoning, from which several Chinamen died, traced to the species of bêche-de-mer known as "red prickly fish." The "fish" had been boiled in a copper receptacle, and it seemed probable that the boiling exuded juices which acted on the copper.

Echinoidea (*Sea-urchins*).—The brittle, sharp-pointed species of sea-urchins may cause much trouble by piercing the skin and breaking off, when the fragments are exceedingly difficult to extract. Saville-Kent* says that the long, slender-spined sea-urchin, *Diadema setosa*, abounds in places in serial clusters. Their spines are slender, 8 or 10 in. long, and sharper than needles. "The points of the spines of this sea-urchin, though so easily embedded in the flesh, are very difficult to extract. Left alone, they in a week or two apparently disappear, and the author was of the opinion that, being almost pure carbonate of lime, they probably dissolved in the blood. Professor A. C. Haddon has, however, informed him that the spine points, like incepted needles, have, in his own experience, after a year's interval, worked their way out at remote distances from where they entered."

Banfield, in his "Confessions of a Beach-comber," also refers to this species.

Mr. E. C. Harris has informed me that in British New Guinea he has seen natives and a white man injured by standing on the spines of a sea-urchin the size of an orange, with black prongs tipped with white. The pain is agonizing and the patient has to be held down, and nearly dies from the pain, which lasts some hours. The spines break off in the wound.

* "The Great Barrier Reef," p. 42.

PHYLUM COELENTERATA.

The stinging produced by this class of animals is well known, and we are all acquainted with the mechanism by which it is produced. The large brown jelly-fishes, Rhizostoma, which are common around the Australian coast, frequently produce stings on bathers when they come in contact with them. Experimentally in December, on allowing the trailers to come in contact with the bare arm, a kind of slime was left, followed by a faint prickling sensation. Later, in my case, this was followed by scattered small erythematous spots, fading away in about an hour. In other individuals severe urticaria may result.

The "Portuguese man-of-war," *Physalia pelagica*, is a common cause of severe irritation in children who come in contact with the tentacles on the coast of Eastern Australia. Dr. George Bennett, in "Wanderings in New South Wales," published in 1834, and in "Gatherings of a Naturalist in Australasia," published in 1860, describes very accurately and fully the symptoms and sequence of events. These are well worth repeating here:—

Stings of *Psysalia pelagica*. "Situated beneath the inflated vesicle of the Physalia a dense mass of tentacula is observed, some of which are short and thick, while others are several feet in length. . . . . The long tentacula or cables, when minutely examined, seem to consist of a chain of globules, filled with fluid, and they have an oval plate or sucker at the free extremity." On seizing it, persons "soon drop it on finding the long adhesive appendages tenaciously attached to their hands, inflicting most painful stings—more severe than such a creature could have been supposed capable of producing. On one occasion I tried the experiment of its stinging powers upon myself, intentionally, when, on seizing it by the bladder portion, it raised the long cables by muscular contraction of the bands situated at the base of the feelers, and, entwining the slender appendages about my hand and fingers, inflicted severe and peculiarly pungent pain, adhering most tenaciously at the same time, so as to be extremely difficult of removal. The stinging continued during the whole time that the effects were not merely confined to the acute pungency inflicted, but produced a great degree of constitutional irritation; the pain extended upwards along the arm, increasing not only in extent but in severity, apparently acting along the course of the absorbents, and could only be compared to a severe rheumatic attack; the pulse was accelerated, and a feverish state of the whole system produced; the muscles of the chest even were affected, the same distressing pain being felt on taking a full respiration as obtains in a case of acute rheumatism. The secondary effects were very severe, continuing for nearly three-quarters of an hour; the duration of the pain being probably longer in consequence of the time and delay occasioned by removing the exciting and virulent tentacula from the skin, as they adhered to it, by the aid of the stinging capsules, with an annoying degree of tenacity. On the whole being removed, the pain began gradually to abate; but during the day a peculiar numbness was felt, accompanied also by an increased temperature in the limb upon which the stings had been inflicted. For some hours afterwards the skin displayed several white elevations or weals on the part stung, similar to those usually seen resulting from the poison of the stinging-nettle. The intensity of the pain depends in some degree upon the size and consequent power of the creature; and after it has been removed from the water for some time, the stinging property, although still continuing to act, is found to have perceptibly diminished. To remove the irritation, at first cold water was applied; but this, instead of alleviating, increased the evil; an application of vinegar relieved the unpleasant symptoms and olive-oil produced a similar beneficial effect. I have observed that this irritative power is retained for some weeks after the death of the animal in the vesicles of the cables; and even linen cloth, which had been used for wiping off the adhering tentacula, when touched, still retained the pungency, although it had lost the power of producing such violent constitutional irritation."

Though not strictly Australian, the following reference by Mrs. Edgeworth David, in her "Funafuti" (p. 247), deals with the "Portuguese man-o'-war." "The natives were much more afraid of a Portuguese man-o'-war than of a shark, and if the harmless looking blue cable of one of these queer creatures happened to twine itself round an oar that a native was holding, that native would leave hurriedly."

Of the flexible seaweed-like hydroid zoophytes, Saville-Kent* says that one species, *Aglaophenia* (*? macgillivrayi*), occurring in some abundance in the pools off Cape Flattery, is familiar to bêche-de-mer fishers on account of its stinging properties. When handled, or incautiously trodden on with bare feet while wading, the sting produced by its polyparies much resembles that caused by an ordinary stinging-nettle, or the stinging anemone, *Actinodendron alcyonoideum*. The rash raised, as personally tested, remains conspicuously visible, and is accompanied by gradually decreasing local irritation, for about a week.

Of the medusæ or jelly-fishes, Saville-Kent states that many of them, more notably the so-called "Portuguese man-o'-war," *Physalis pelagica*, are conspicuous for their severe stinging properties. "There is one species, however, that has been reported to the author as not unfrequently appearing in Cleveland Bay, off Townsville, whose urticating properties are so severe that death has been known to result to bathers from contact with its training tentacles. The efforts that have been made to obtain either specimens of this noxious Hydrozoon, or sufficient data for its approximate specific identification, have so far proved unsuccessful. It would appear, however, from the scant evidence

* "The Great Barrier Reef," p. 203.

gathered, to be a representative of the Physophorous medusæ, rather than a form allied to Physalia. It is worthy of note that a large proportion of the free-swimming medusæ represent the sexually specialized derivatives of sedentary compound hydroids, from whose polyparies they become detached as minute transparent bells, which may rapidly grow to relatively gigantic dimensions. The possibility naturally suggests itself that the death-dealing medusa of Cleveland Bay is the derivative of the sedentary, urticating Aglaophenia previously mentioned."

In May, 1911, appeared a telegram in the Sydney daily press stating that one (or two) boys had died at Pioneer Bay, near Mackay, on the Queensland coast, from the stings of a jelly-fish, whose long, thread-like tentacles adhered to the chest, stomach and arms. The animal was probably the species referred to by Saville-Kent.

In an article on "Fish Poison," by Dr. E. M. Worth (*A.M.J.*, September, 1877, p. 273), surgeon to the Burdekin and Flinders District Hospital, Queensland, stings by medusæ are mentioned. While bathing, people not infrequently feel something like an electric shock, with a stinging sensation on some part of the body. Sometimes on coming out of the water, a medusa is found attached to the skin. The patients soon become faint and sick and in the case of children remain for four or five days drowsy and feverish. For several days numerous red patches may be seen on the part attacked—these are more or less painful and end in excoriation of the skin.

Mr. E. C. Harris has informed me that persons, when paddling in shallow water on the coast of British New Guinea, are sometimes "stung" by a slimy stuff, apparently from a jelly-fish, which adheres to the hairs and may cause trouble for many days. The sting raises a blister in two minutes.

I have been personally informed by the victim that, whilst bathing at Encounter Bay, South Australia, he was stung on the chest, apparently by a jelly-fish. An enormous blister followed. Where the sting and consequent blistering is more extensive, it can easily be seen that profound systemic effects may be produced, just as in the case of extensive burns.

Stinging Anemones.—Saville-Kent, in "The Great Barrier Reef," states that a species of Actinodendron, probably *A. alcyonoideum* of Quoy and Gaimard, with long ramifying tentacles, is remarkable for stinging or urticating properties. As personally tested by him, this property was nearly as powerful as that of an ordinary stinging-nettle, and the rash produced on the skin through contact with the animal's stinging-cells or "cnidæ" endured for several days. He ascribes the same characters to another Great Barrier sea-anemone, *Megalactis griffithsi*, Sav.-Kent.

Myriapods.

Centipedes, often of large size and up to 10 in. in length, are common in the interior parts of Australia, but records of injuries from them are few. Those in the interior who have to camp out much, lying on the bare ground, frequently find them in or on their blankets. Dr. Mjoberg, leader of the recent Swedish Scientific Expedition to North-west Australia, was, according to the report in the daily press of an interview with him, bitten on the finger and shoulder by a centipede, and had his arm in bandages afterwards for three weeks.

Notes and News.

The Society of Tropical Medicine and Hygiene.—At a meeting of the Society of Tropical Medicine and Hygiene, held at 11, Chandos Street, Cavendish Square, London, W., on Friday, January 17, 1913, a paper upon "Recent Advances in our Knowledge of Sleeping Sickness," by Arthur G. Bagshawe, M.B., D.P.H.Cantab., was read. The following gentlemen were elected Fellows: Rudolph de Mello, L.R.C.P., Zanzibar; Charles Hardwicke, M.D., Mexico; William Francis Law, M.D., Dublin; Charles J. Martin, M.B., F.R.S., Chelsea; Lieutenant-Colonel J. J. Pratt, F.R.C.S., I.M.S., London; Sir David Semple, M.D., Kasauli; William R. Watson, M.B., Dublin.

An Historical Medical Exhibition in London.—For the first time in twenty-one years the International Medical Congress will meet in London in the summer of 1913, and, in this connection, an exhibition of rare and curious objects relating to medicine, chemistry, and pharmacy and the allied sciences is being organized by Mr. Henry S. Wellcome. The response to the appeal for loans has been most successful, with the result that probably one of the most interesting collections of historical medical objects ever gathered together will be on exhibition during the meeting of the Congress.

Among other interesting sections is one including the medical deities of savage, barbaric, and other primitive peoples. Through the kindness of friends, specimens of these have been forwarded from all parts of the globe, but there are still many gaps to be filled, and those who possess such objects, and would be willing to loan them, should communicate with the Secretary of the Exhibition, whose address is given below.

Amulets, talismans, and charms connected with the arts of healing will also form another prominent feature, and any loans of this description would be welcomed.

In the section of surgery, an endeavour will be made to trace the evolution and development of the chief instruments in use at the present day, and it is desired to accumulate specimens of instruments used in every part of the world by both savage and civilized peoples.

In pharmacy and in botany special exhibits are projected, which will include models of ancient pharmacies, laboratories, and curious relics of the practice of alchemy in early times. Specimens of

ancient and unusual materia medica from all parts of the world will also be exhibited.

A complete illustrated syllabus will be forwarded to anyone interested on application to the Secretary, 54a, Wigmore Street, London, W., England.

ASIA MINOR AS A NUT-PRODUCING COUNTRY.—Walnuts are exported from Smyrna to the extent annually of about 12,000 sacks of about 100 lb. each.

Pistachio nuts also come from Syria. As many as 5,000 sacks of 100 lb. each are exported from Aleppo alone.

Almonds are of two varieties, one native to Syria and the other from the island of Chios; the latter is small, soft, and delicately flavoured. Native almonds are exported to the amount of 3,000 sacks, and Chios almonds to the extent of 50,000 sacks annually.

Filberts are a product of the Black Sea littoral; as many as 50,000 sacks of 100 lb. each are sent abroad.

Correspondence.

To the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

DEAR SIRS,—I read in No. 22, 1911, of your esteemed journal a short notice about my publication in the *Lancet* of October, 1911. At one place it is said, "The author seems to have forgotten, or not to have heard of, Patton's work in India on the development of *Leishmania donovani* in bugs."

I wish to say that I know and have not at all forgotten the researches of Patton and of others who have worked at this subject, including the recent studies concerning the relations between mosquitoes and tropical Leishmania. The article, however, not being a complete work, but merely a simple notice which I published in the *Lancet*, it had to be as short as possible, and I had to omit references, the more so as nobody had made any observations on *Anopheles claviger*.

As to experiments on bugs, though fully acknowledging the importance of Patton's researches, I am obliged to state that in 500 preparations of bugs and fleas, infected with cultures of *L. donovani*, no traces of parasites in the digestive tubes of these insects were ever found. (*Pathologia*, No. 68, 1911, and *Malaria e malattie dei paesi caldi*, June 1911).

Basile in a notice has confirmed my researches (R. Academia dei Lincei Conference, June 18, 1911.)

Quite recently Professor Gabbi failed to infect bugs (canine and human ones) with the spleen-juice of specimens infected with kala-azar (*Malaria e malattie dei paesi caldi*, No. 10, October 1911).

Whether these researches are, or are not, of any value cannot be decided offhand.

With best regards, believe me,

Yours respectfully,

DR. PROFESSOR FRANCHINI.

Clinica delle malattie tropicale in Roma,
Policlinico Umberto (Dir., Prof. Gabbi).

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"The Lancet," November 30, 1912.

A Suggested Treatment for Trypanosomiasis.—Johnson suggests that anarcotine, an alkaloid of opium, might be tried in the treatment of sleeping sickness. Sir William Roberts, in 1895, stated that this drug had been used in India with success in the treatment of malaria. So impressed with its powers was this author that he said that there seemed to be valid evidence that in it (anarcotine) we possessed a second antiperiodic of great power, analogous to, but not identical with, quinine. So far as one knows it has not been used again, at least, not extensively, and it will be interesting to see if it has any action on trypanosomiasis.

"Annals of Tropical Medicine and Parasitology," December 30, 1912,

The Resistance of Ticks to Sheep Dips.—Blacklock tested the resistance of *Ornithodorus moubata* to various sheep dips. He found that, (1) the dips tested failed very frequently to prevent *Ornithodorus moubata* feeding on an animal. (2) Feeding ticks were not easily caused to loosen their hold by them. (3) In test tube experiments the resistance of this species of tick to these substances in solution is marked. (4) Used in the strength recommended and for the time suggested these dips appear to have very slight effects on this tick. (5) Possibly other ticks behave in a different manner under these applications.

"Annals of Tropical Medicine and Parasitology," December 30, 1912.

The Resistance of Bugs to various Reagents.—Blacklock tested the resistance of *Cimex lectularius* to various reagents, powders, liquids and gases. The conclusions of his researches are as follows: (1) *Cimex lectularius* whether in the larval or adult stage is not readily killed by depriving it of human blood. (2) It may thus remain alive and active for months in houses which have ceased to be inhabited. (3) Houses on being re-occupied after being empty for months may still be found infested with bugs. (4) Bed-bugs may transmit certain diseases from one human being to another. Therefore, it is inadvisable that bugs and human beings should occupy the same house. (5) Human beings must be protected from the attacks of bed-bugs. (6) There is no evidence that bed-bugs can be cleared out of a house by insecticide powders. Experiment suggests that powders are of very limited utility. (7) The same applies to liquid remedies. (8) Gaseous substances present the best prospect of success. (9) Of such substances, sulphur dioxide is cheap and effective. (10) Sulphur dioxide gas under pressure for two minutes, kills with certainty all stages in the cycle of development of the bug, including the egg.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

INDIAN ORO-PHARYNGEAL LEISHMANIASIS.

By Aldo Castellani, M.D.

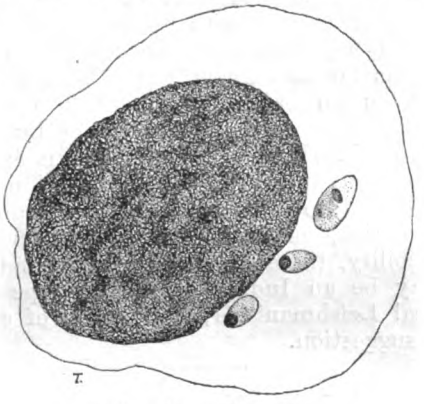
Director, Government Clinic for Tropical Diseases, Colombo (Ceylon).

It may perhaps be of interest to put on record a case of a peculiar ulcerative condition of the throat in which Leishmania bodies were found. A few days before leaving Colombo I was consulted by a European who had been in India for twenty years and was then going on a long holiday. He desired to obtain relief for certain intractable ulcers of the pharynx. The patient was apparently in fairly good general health; he was a man aged 38, tall, strongly built, and with a tendency to stoutness. There was no history of syphilis, nor of any skin disease of any kind. He merely complained of an ulcerative condition of his throat, which, according to him, had been most persistent, having started nine years previously. The condition gave him a certain amount of discomfort, but was not very painful. A local examination showed the presence of several ulcers on the posterior wall of the pharynx and on the soft palate; they were roundish and of various sizes, but none very large, mostly a quarter to a half a centimetre in diameter; some were covered by whitish *débris*, none did show any signs of vegetations nor any framboesiform appearance. The lymphatic glands of the neck were not enlarged.

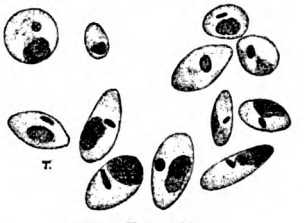
The patient informed me that the ulcers had been treated in various ways, including cauterization, which gave some temporary relief. Energetic antisyphilitic treatment by mercury inunctions and potassium iodide had given no result whatever. I made deep scrapings from the ulcers and stained them by Leishman's stain. The microscopical examination revealed the presence of Leishmania bodies, not very numerous, but quite typical and apparently very similar or identical to *L. donovani* and *L. tropica*. Cultivations were not carried out. On further questioning the patient the fact was elicited that for the last few years he had had attacks of fever to which he attached no importance, considering them to be of malarial origin. I examined the blood; no malarial parasites or pigment were present; there was a slight mononuclear increase. The physical examination of the patient revealed nothing abnormal; the spleen seemed to be slightly enlarged on percussion, and was just palpable on very deep inspiration; the liver was not enlarged. Further researches in this case were not possible, as he left for Japan and myself for Europe. I give a drawing made by Mr. Terzi from the preparations still in my possession; these are, at the present time, slightly faded, but the Leishmania bodies are still very evident, and have been seen by Sir William Leishman, Dr. Chalmers, Dr. Low, and others.

The above case recalled vividly to my mind a patient I had seen some time before, also from India. A few words on his case may not be out of place.

This patient also had been many years in India. There was no history of syphilis or any skin disease. He had several rather small ulcers on the posterior wall of the pharynx and whitish scars on the soft palate and hard palate, due to previous ulcers which had been cauterized. The ulcers were rather small, some covered with *débris*, with no granulomatous appearance, and not bleeding. There was not much pain. The condition, according to the patient, was of many years' standing. The first impression I had was that it might be a case of blastomycosis, and I inoculated several maltose agar tubes with scrapings. As a matter of routine I directed the patient to undress and I made a general physical examination; nothing abnormal was found in the thoracic organs, but I was surprised to find the spleen was very much enlarged.



Intracellular Parasites.



Free Parasites.

On closely questioning the patient I elicited the fact that he had been suffering for several years from attacks of fever, to which he had not attached much importance, believing it to be malaria. The blood did not show Laveran's parasites. The idea struck me that it might be a case of kala-azar with ulcerative localizations in the throat. I examined the scrapings, with negative result; but the patient had to return to India and further examinations could not be obtained. In the letter to his medical attendant I expressed the suggestion that the case might perhaps be one of kala-azar with localizations in the throat. The further history of the patient is unknown to me.

Résumé and Remarks.—In a case of a peculiar persistent ulcerative condition of the pharynx and soft palate, in a patient who had long resided in

India, Leishman's bodies were found. It is possible that the other case I have recorded may have been of the same nature, but the microscopical examination having been negative the following remarks cannot be applied to it.

The question arises: was the condition oriental sore with ulcerative lesions of the throat? Was the condition kala azar, or a separate form of Leishmaniasis, somewhat comparable to the oral Leishmaniasis or the Espundia of South America, so well investigated by Splendore, Bueno de Miranda, Carini, Robledo, Laveran, Nattan Larrier, and others?

Cases of oriental sore with localization on the oral mucosa have been described by Cardamatis in Greece, and Gabbi and Lacava in Italy. In my case there were no cutaneous lesions of any kind and no history of such; moreover, the condition had been present, according to the patient, for more than nine years; in oriental sore the course of the disease is not as long as that. The case may have been one of kala azar with ulcerative localizations on the pharynx, though this manifestation of kala azar has, as far as I know, never been described; moreover, in an ordinary case of kala azar the general condition of the patient after nine years, if he were still alive, would have been extremely bad. The appearance of the ulcers did not seem to be identical to that found in the Espundia of South America, as they were not framboesiform. The possibility, therefore, cannot be excluded that there may be an Indian or Asiatic type of oro-pharyngeal Leishmaniasis; but this is of course a purely a suggestion.

PRELIMINARY NOTE ON THE IDENTITY OF CERTAIN LEISHMANIASES BASED ON BIOLOGICAL REACTIONS.

By Professor Ivo Bandi, Naples.

During the month of July, 1912, I undertook some experimental work in order to satisfy myself whether the intra-organic destruction of the Leishmania bodies would bring about the formation of substances having a specific action on these parasites.

The practical object of my experiments was to find out a method of diagnosis, based on biological reactions, to which a specific character is universally attributed. At the present time the diagnosis of human Leishmaniasis is based almost solely on the microscopical examination of the spleen and liver juice, which may, however, give negative results.

The first part of my researches consisted in carrying out experiments in order to make evident if, and in what measure, there is an elaboration of specific substances in the blood of animals which have been inoculated with Leishmania cultures. I used a strain of *Leishmania infantum*, and one from canine kala-azar, both of which I obtained direct from C. Nicolle during my recent tour of investigation in Tunis.

Some rabbits were injected intravenously with cultures of the Leishmania of human origin, and others with the cultures of the Leishmania of canine origin.

I have observed that the repeated intravenous injections, while not giving rise to a pathological condition, induce the formation in the blood of specific substances which agglomerate the parasites and can be compared to bacterial agglutinins. The serum of the inoculated rabbits showed this property in a dilution up to 1 in 200. The serum of normal rabbits had no action. Hitherto I have not noted any distinct lithical property in the sera of the inoculated animals.

The serum of rabbits inoculated with canine Leishmania agglutinated this parasite up to a dilution of 1 in 160. The serum of rabbits inoculated with canine Leishmania agglutinated *L. infantum* also up to a dilution of 1 in 160. Sera of either the rabbits inoculated with *L. infantum* or canine Leishmania, agglutinated *L. tropica* only up to a dilution of 1 in 70. There is, therefore, a Leishmanial group agglutination, but the fact that the blood of rabbits inoculated with *L. infantum* influences canine Leishmania to practically the same extent as the homologous parasite, and vice versa, tends to support the opinion held by most observers that infantile kala azar and canine kala-azar are due to the same species of Leishmania.

These experiments corroborate the epidemiological and micro-biological observations carried out by Nicolle and other investigators, and the recent experimental work by Basile, all of which show us the way to follow in the prophylaxis of this infection.

A CASE OF PARA-MELITENSIS FEVER.

By Fleet-Surgeon P. W. Bassett-Smith, R.N., C.B.
Royal Naval College, Greenwich.

In May and July, 1912, Nègre and Raymond [1] demonstrated the presence of a distinct variety of the *Micrococcus melitensis*, which they called *M. para-melitensis*. This organism was obtained from Dr. Nicolle [2], Tunis, and was known there as *M. melitensis*, Br. Though this form had all the morphological and cultural characters of the true *M. melitensis* it differed in its agglutination reactions, and Nègre and Raymond by a series of experiments showed, that though the blood serum of a case of undulant fever might agglutinate with this strain in low dilutions, it would not do so with the high ones which were given by the original strain. Further, by a series of absorption experiments, it was found that the para-melitensis organism did not remove the specific agglutinins for the *M. melitensis* and vice versa, neither was the immune serum of an animal inoculated with the para-melitensis strain able to agglutinate the *M. melitensis* in such high dilutions as its own homologous organism. They therefore came to the conclusion that there occurred a para-melitensis infection distinct from the ordinary undulant fever produced by the *M. melitensis*.

The following case which is, I believe, the first of this kind to be recorded, is important, as it has many peculiar features, and has been most difficult to diagnose. The patient, while at Hyères, in the Riviera, January, 1910, contracted a fever which was associated with joint pains, neuritis, obstinate

constipation, profuse perspirations, loss of weight, and general malaise; this was believed to be an irregular attack of influenza, the fever lasted for five weeks, and when a little better the patient went to Monte Carlo.

The fever was of an undulant character, there was much wasting and debility, the fingers and wrists were painful and swollen, at times the knees and ankles; many neuritic symptoms were also present. Infective rheumatoid arthritis was feared. Tubercle, ulcerative endocarditis, paratyphoid, pernicious anæmia, &c., were excluded. In April, 1911, the diagnosis was either post-influenzal infection, or a toxic trophic neurosis. On returning to London a careful examination was made of the blood, by agglutination tests, &c., by several leading experts, but beyond showing slight secondary anæmia it gave no clue to the cause of the disease. The patient was getting steadily worse, and as a diagnosis of pyorrhœa had been made, an autogenous streptococcic vaccine was used without giving any benefit. Double sciatica now came on. From June, 1911, the patient was very seriously ill for three months with high temperature, rigors, night sweats, painful joints, double sciatica and insomnia, and a muco-membranous colitis set in. During the latter part of July and August the patient though very ill was able to lie in the open air, it being very fine. From August 4 attacks of fever, generally lasting eight days, came on fairly regularly about every ten days, there being short periods of apyrexia between these attacks. From October, 1911, to April, 1912, the patient remained in this condition, the arthritis of the hands and the undulant fever being the most marked symptoms. There was then a period of five weeks' normal temperature, then again came the recurring irregular attacks of fever for six months further, with slight enlargement of the spleen during the attacks. The patient often had to stay in bed, and was always a confirmed invalid. From November, 1911, to January, 1912, he remained in London and suffered from an irritable short cough, but no definite cause was found. Examination of the fæces showed an abundant flora, but this was thought to be of a secondary character. Great numbers of drugs were tried, chrismol giving the most relief for the intestinal symptoms.

A diagnosis of undulant fever was made by several observers from the clinical symptoms, but as it could not be confirmed, either by culture of the micro-organisms from blood or urine, by agglutination reaction, or by the complement fixation method, no positive opinion could be given. Through the kindness of those in charge of the case I was able to test the blood many times, and in January, 1912, having received a culture of the *M. melitensis*, Br. (*M. para-melitensis*) from Dr. Nicolle, I was able again to do so, this time finding a positive agglutination with this organism up to 1/400, and a negative reaction with five other strains of *M. melitensis* in my possession; the reaction was also confirmed by using the absorption method with the two organisms.

A vaccine from this para-melitensis culture was then made and is being used with apparent benefit, but it is too early to judge of its efficacy as yet.

Remarks.—The most important features of the case are, a disease contracted in the South of France, with an irregular undulant fever of two years' duration, associated with arthritic and neuritic symptoms with a moderate amount of wasting and anæmia. A persistent absence of any reactions for ordinary undulant fever, but a positive reaction with the *M. para-melitensis*.

REFERENCES.

[1] Nègre and Raymond: *Comp. Rend. Soc. Biol.*, 1912, May 24, July 5.

[2] Nicolle and Conor: *Arch. Inst. Pasteur*, Tunis, 1912, No. 3, pp. 136-139.

Coccidioidal granuloma.—Bowles, in the *Journal of the American Medical Association*, December 21, 1912, reports a nineteenth case of this rare disease. Up to the present date, eighteen cases have been reported and traced to California, the seventeenth and eighteenth being reported by Brown, of San Francisco, with a review of the literature. The first case in California was discovered by Rixford, of San Francisco, and later described in conjunction with Gilchrist, of the Johns Hopkins Hospital Medical School. Afterwards Ophüls, of San Francisco, described the morphology and characteristics of the fungus, and gave it the name of *Oïdium coccidioides*. He reported thirteen cases, and differentiated the parasite from the closely related *Blastomyces coccidioides* of which much has been written, the latest article being by Hektoen, of Chicago.

Most infected persons came from the lower half of the San Joaquin valley, and were men employed in railway construction or in caring for animals. The duration of the disease, so far reported, is from six months to nine years. Most of the patients gave histories of bone lesions, some having accompanying lesions like hypertrophic lupus. Others gave histories of tumours of the skin followed by ulceration without tendency to heal. Early involvement of the lymph-nodes is frequently seen terminating not unlike tuberculosis.

The mode of infection, whether external or internal, has not been determined, but in the forms that produce a skin infection as the first symptom, the skin can in all probability be determined as the primary focus. In internal cases infection is most frequently seen in the lungs. The infection travels by the blood and lymph streams and in autopsies, the internal organs are more or less attacked with lesions and distributions as in tuberculosis. In its predilection for organs the two diseases are rather similar.

Most of the previous patients were treated with potassium iodide accompanied with surgery. All cases recorded were fatal but one, the first symptom of that one being a bone lesion of the ankle. The leg was amputated before other lesions developed and the patient recovered.

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THE JOURNAL OF

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FEBRUARY 15, 1913.

POLAR EXPLORATION AND ITS BEARING ON MEDICAL STUDIES.

FOR a medical journal devoted to tropical diseases to find points of common interest in the medical aspects of polar exploration would seem an antithesis which requires explanation. Science and its ways, however, have universal application, even when the department of medicine is considered, and to the protozoologist, the helminthologist, and the epidemiologist, and even the entomologist, the Poles, in common with the Equator, come under the scope of their studies. The absence of a disease in any quarter of the globe is as interesting a problem to account for as is the presence of another; for to explain it the air, the soil, the fauna and flora, the geological formation, the extent of communication have to be studied by experts before coming to any conclusion of scientific accuracy. All recent polar expeditions have taken with them experts in several branches of science, and even in the earlier searches for the Pole the medical officer was understood to represent and report for the scientific department. Of recent years, however, research has become so specialized that experts for almost every department of investigation are necessary, and it is to the Tropical Schools of London and Liverpool that we must look for a supply of these experts, for in them, and in them alone, do we find established authorities upon such subjects as helminthology and medical entomology. In all polar scientific expeditions of the future men qualified in these subjects must be included, and we are bound to rely on the Schools of Tropical Medicine to supply them. The mere "travellers'" work in Arctic and Antarctic regions has been accomplished, the Poles have been reached, and there is no justification for further risk of life, of expenditure of time and treasure in this direction except for purely scientific investigations, for commercial purposes, such as the presence of coal, iron, gold, silver, or metals useful in the arts, and for the investigation of all appertaining to disease in its varied and several aspects. It is impossible to even enunciate and far less to specify what these, the last named, may be, but there are several problems which afford food for thought, even with our inadequate knowledge of those remote regions. For instance, we are unaware how far the migration of birds plays a part in the spread of disease; birds now in tropical, now in temperate, latitudes may be and are considered to be the carriers of parasites infective to man; and, on the other hand, birds which inhabit the more northerly or sub-Arctic regions find their way to countries having temperate climates in their breeding seasons. The constantly recurring migrations are not without their importance to the epidemiologist and to the parasitologist and helminthologist. Of late it has been suggested by Dr. Sambon that birds landing on our coasts are the forerunners of outbreaks of diphtheria, and Dr. Sambon's well-considered forecasts in the past have proved to be the confirmed realities of the present in several instances. The ailment most frequently referred to in frigid zones is scurvy, and we have come to regard this disease as peculiar to these regions; an unfortunate view, for scorbutic conditions are by no means confined to the coldest latitudes. As the writer has so often stated, many of the intestinal troubles so frequently met with in the Tropics come, at any rate in their later stages, to partake of the nature of scurvy, and owing to the non-recognition of the condition cure is delayed or rendered wholly impossible. Especially is this the case in sprue. It may even be said that the appearance of sprue is coincident with a limitation of diet calculated to produce a scorbutic taint. The initial departure from health may be a simple indigestion due to "liver" or to gastric catarrh, &c.; the diet is modified for the time, or may be cut down, most frequently by the patient himself or herself, to the most meagre extent in the hope of getting rid of the trouble. Fruit and meat are eliminated, and milk and, perhaps, farinaceous food are alone taken. Should this treatment be persisted in the patient becomes anæmic, weak, and dreads taking any form of food. Sameness of low diet we know breeds diarrhœa in time, and in out-of-the-way places both the milk and other nutriment may be poor or "tinned." A scorbutic condition is inevitable with wasting, weakness, skin rash of purpuric-looking patches, receding gums, pyorrhœa and mouth irritation, and a shrinking of organs, such as the liver and spleen. Without entering into the discussion as to whether sprue is due to a specific organism or not, we have enough to indicate a scorbutic sequel at all events, and until this is recognized and acted upon the patient may be kept alive, but cannot be cured. When the diet is changed to fresh meat and fruit a change immediately takes place, and the reported cure of sprue by strawberries is readily explained. That patients are cured by taking strawberries is

undoubted, but so they are by other fruit and by fresh meat, especially when underdone or raw, in the form of fresh meat juice or scraped beef. It is hinted also, by several "old tropical hands," that a meagre diet is provocative of sprue; some even say that people who designedly live poorly are subject to sprue. "Live well and you will be well," is the motto of many experienced tropical residents, and the advice given by a planter in Ceylon to his staff to "avoid alcohol and eat liberally" seems to have been followed by excellent results. The accusation often brought against British folk in the Tropics is that they live too well; this is not in accordance with fact, for the well fed thrive better than those who, owing to fads as to living, cut down their nutriment to the level of the "nut and raisin" diet, which some hysterical people profess to subsist on. Scurvy is not limited to men engaged in polar expeditions; it is present under various manifestations and guises in the Tropics and complicates many of the ailments met with. The signs and symptoms of scurvy present no definite specific grouping; now there is diarrhœa, now a mere revulsion against food, or cutaneous manifestations are present, the blue line on gums, &c.; but all are seldom present, and one person presents them in one form and another person under similar conditions of food, &c., in yet another form. It would be well were practitioners in the Tropics, and in temperate regions as well, to bear the possibilities of scorbutic tendencies in mind, and by acting upon them they will get rid of many of the phenomena which are inexplicable by any other connection.

Were we to bring the diseases possibly spread by fish into the discussion, we have here again a migratory animal passing from cold regions to temperate and presenting the possibility of its being the transmitter or the generator of disease in man. Dogs, again, which always take part in all polar expeditions, are not without their bearing upon man in the matter of conveying disease. Let it also be pointed out that overcrowding is unhealthy, be it in a tent with frozen canvas covered by snow, in a cabin cut out in a mass of snow, where ventilation is well-nigh impossible owing to climatic conditions and in which a number of men live for weeks or months with unwashed skins and wear unwashed clothes. These conditions are all calculated to generate disease, now of a specific, now of a non-specific type.

We have much to learn from Arctic expeditions in their medical aspects, and these lessons are applicable not only in temperate climates but also in the Tropics, and we hope that when next a scientific expedition is fitted out we shall find that the helminthologist, the protozoologist, and the entomologist are furnished with a place in the staff, otherwise the expedition will be shorn of its usefulness and remain a mere "travellers'" procession, as it has to a large extent—and rightly so—been in the past.

J. C.

Annotations.

Treatment of Dysentery due to Infection with Entamœba histolytica.—Deeks, writing on this subject in the *Journal of the American Medical Association*, January 4, 1913, states that the following forms of dysentery are more or less frequently encountered in Ancon Hospital and for the most part can be readily differentiated:—

"(1) Amœbic dysentery, caused by the *E. histolytica* of Schaudinn.

"(2) Amœbic dysentery, caused by the *E. tetragena* of Viereck.

"(3) Bacillary dysentery, caused by Shiga's or Flexner's bacillus, and the allied varieties.

"(4) Bilharzial dysentery, caused by the *Schistosomum mansoni*.

"(5) Balantidial dysentery, caused by the *Balantidium coli*.

"(6) Malarial dysentery, occurring in the course of a general malarial infection.

"(7) Dysentery due to tuberculous ulceration of the intestine.

"(8) Nephritic dysentery, associated with acute diffuse nephritis or secondary to a chronic nephritis with an acute process superadded.

"(9) Diphtheritic colitis, associated with a diphtheritic or a gangrenous inflammation of the mucous membrane of the whole colon, rectum and part of the adjacent small intestine—a very fatal form.

"(10) Dysentery in the course of pellagra.

"(11) Dysentery resulting from the ingestion of decomposing meats or fish.

"(12) Dysentery resulting from the ingestion of infected milk. The last two may be bacillary in character.

"(13) Dysentery secondary to cardiac or to hepatic disease."

As regards the treatment of the amœbic forms he states that:—

"(1) Amœbicidal irrigations are useless.

"(2) The bismuth-milk-saline method of treatment gives, in almost all cases, a perfect result, if the lines indicated for its administration are adhered to.

"(3) This method of treatment gives a maximum of cures with a minimum of recurrences and metastatic developments, the most frequent of which is liver abscess. This offers a serious complication in the treatment, particularly if of the acute or fulminating type.

"(4) Occasionally, in extreme cases, surgical interference, after Dr. A. B. Herricks' method, is indicated."

(With ipecacuanha and emetine going so strongly in the treatment of amœbic dysentery at the present day Deeks will find few supporters of his bismuth-milk-saline method.)

Cultivation of Malarial Plasmodia.—Lavinder in the *Journal of the American Medical Association*

for January 4, 1913, contributes a brief note in confirmation of the results of Bass and Johns in cultivating malarial parasites.

The technique outlined by these authors was adhered to closely, and no essential deviation was made from their description. In two of the cases the attempt was made to cultivate the second generation. In doing this use was made of only one of the methods given by Bass and Johns. This method was by the test-tube fitted with the little shelf of paper supported by a piece of glass rod, as described in their paper.

In the first case, at the time blood was drawn, smears from the punctured ear showed a rather heavy infection of *Plasmodium falciparum*, small ring forms. This culture was made in the late afternoon. The next morning many larger, pigmented forms were observed. The culture was returned to the incubator, but on later examination it was evident that growth had ceased. Lavinder thinks it very likely that this culture was killed by undue tilting of the tube in handling. The parasites, according to Bass and Johns, grow only in the superficial layer of blood cells, and if the tube is tilted and this top layer disturbed it results in death of the parasites.

In the second case, at the time blood was drawn, smears from the ear showed a light infection of *P. malariæ*. Indeed, the parasites were quite scanty, only half a dozen being found in a twenty minutes' search of a well-stained slide. The culture from this case was not successful.

The third case was another heavy infection of *P. falciparum*. All forms seen in the smear from the ear, at the time blood was drawn, were small rings without pigment. In this case, as in the second, the attempt was made to grow the first as well as the second generation. That is, the blood was drawn, mixed with the dextrose solution, defibrinated, and centrifugalized to get off the serum and to eliminate leucocytes in the tubes for the second generation. The tube with the little paper shelf was then prepared, and the original tube was preserved also. Both were incubated at 40° C. In this case the parasites grew readily in both tubes and went on to sporulation, but for some reason the merozoites did not enter fresh blood-cells, and of course growth ceased. All conditions seemed favourable, and this result was a disappointment.

This successful culture was made from a case of very persistent infection, which had been under treatment in our wards for some time. At the time the culture was made the patient was suffering from a fresh outbreak.

No attempt was made to differentiate varieties, but the parasites developed into large forms and rosettes in something over thirty hours. The sporulation was not uniform and continued to take place for some time. Motility was observed in the pigment granules, but amœboid movement in the parasites was not so prominent. In the tube from which the leucocytes had not been removed (original tube), phagocytosis of the rosette forms was occasionally observed. This, as Bass and Johns state, probably occurs after the parasite has digested the capsule of the red cell or otherwise damaged it, since leucocytes will not attack parasites in an uninjured red cell.

With Leishman's stain Lavinder succeeded in staining the parasites readily when the first rosettes developed, but later for some reason he was not successful. He states, that as Bass had said, it is only necessary to see such a stained slide to feel convinced of the growth of the parasites *in vitro*, for such pictures are not observed in the peripheral blood of cases of malaria.

The Blood-vessels in Beriberi.—Ogata in the *Sei-I-Kwai Medical Journal*, vol. xxxi, No. 11, November 10, 1912, writes on the blood-vessels in beriberi. He studied the rigor mortis in non-beriberi vessels. His conclusions were as follows:—

(*a*) The results of rigor mortis in non-beriberi vessels.

(1) The blood-vessels undergo marked changes after death, and consequently the blood-vessels seen under the microscope do not show the state of the vessels before death.

(2) Although the vessels contract in the agony of death, they relax to a certain extent after a time, and on the appearance of the rigor mortis they contract again. Finally after a certain period they become quite soft through autolysis.

(3) There are no exact and characteristic differences between the vessels which were contracted during life and those which were relaxed during life.

(4) By the degrees of the vessels' rigor mortis one cannot judge the degree of the vessels' contraction during life.

(5) The rigor mortis of the vessels in men appears gradually two to three hours after death and reaches its maximum seven to fifteen hours after death. After that it gradually disappears, and after twenty-four hours the vessels are absolutely relaxed. The individual characteristics and the external influences produce great differences in its occurrence.

(*b*) The results in the vessels in beriberi.

(1) The appearance and disappearance of the rigor mortis of the vessels after death are nearly the same as in the non-beriberi vessels as regards the time, but the contractions of the vessels are somewhat stronger in the beriberi vessels.

(2) The maximum contraction of the beriberi vessels described as seen in microscopical specimens is probably due to the rigor mortis.

(3) As already mentioned the extent of the vessels' rigor mortis is no standard of the degree of the vessels' contraction during life one cannot deduct from the presence of the maximal contraction of the vessels the spastic state of the vessels during life.

(4) As regards the states of contractions of the vessels before the rigor mortis sets in, there are no marked differences between the beriberi and non-beriberi cases, but morphologically the author noticed some differences. In those beriberi cases which were autopsied soon after death one already

notices that the spaces in the tunica media are prominent, and that also there is unevenness in the thickness of the tunica media. One misses those changes in the non-beriberi cases.

(5) In the dorsal artery of the foot in one case a transmigration of the cells of the involuntary muscle fibres was recognized.

(6) If the unevenness in the thickness of the tunica media and the transmigration of the cells of involuntary muscle fibres are a rare event in the non-beriberi cases these changes ought to help one in judging the state of the vessels before death. If those changes are the result of the looseness in the connections between the tissue cells of the tunica media, they coincide with the relaxed state of the vessels noticed frequently by clinicians, but they may be the result of a spastic contraction. Thus whether those changes are due to the relaxation or contraction is still unknown.

(7) No rupture of the elastic fibres as mentioned by Glogner was observed.

(8) There was a slight thickening and fatty degeneration (so-called endoarteritis) of the tunica intima in the large arteries.

(9) Swelling and vacuole formations were observed in the endothelial cells in several cases.

(10) Thrombosis was present in the femoral artery in two cases out of eight.

(11) The dilatation of the trunk of the pulmonary artery was not marked in the author's cases.

(12) In three cases out of eight, marked tortuosity of the pulmonary vessels was noticed.

(13) The follicles of the spleen showed hyaline degeneration in all cases.

Plague in the Philippine Islands.—In the *Quarterly Report of the Bureau of Health for the Philippine Islands*—Second quarter, 1912—Heiser states that after an absence of six years in human beings and five years among rats, plague was again found in the Philippine Islands, on June 17, 1912. A Filipino employed as a watchman at No. 235, Calle San Jacinto, in the Chinese district, who resided at No. 920, Calle Antonio Rivera, was found dead at his home, on the date mentioned above, after an illness of about three days. On *post-mortem* examination, typical plague buboes were found in the right groin and axilla. Smears made from the spleen showed Gram negative, bipolar staining organisms, and inoculations made into guinea pigs resulted in typical attacks of plague. The organism which was recovered from the guinea pigs agglutinated plague serum in high dilutions. The source of the infection is unknown. The nearest known focus of plague is at Hongkong, and there is no evidence to show that this man had been out of the country during the past few years. Test examination of rats caught in the different districts of Manila, particularly those from importers' warehouses, have been made at weekly intervals throughout the year since 1907 and have always proven negative.

Houses in the vicinity of which the man resided, and where he worked, showed evidences of rat infestation, but an examination made of many hundreds of rats caught there failed to reveal any plague infection, nor was there any history of unusual rat mortality having occurred anywhere in Manila.

The second death occurred on June 26, in the person of a Filipino woman, aged 44, at 1615, Calle Azcarraga, near the Arranque Market. She was found alive, in her house, and had been ill for three days. At the time she was transferred to the San Lazaro Hospital she had a temperature of 41° C. and was in a dying condition. The autopsy showed slightly enlarged glands in the left groin, but the other usual autopsy findings of plague were conspicuous by their absence. Smear preparations made from the glands of the groin and from sections of the spleen showed Gram negative, bipolar staining bacilli. Inoculations made into guinea pigs produced typical attacks of plague, and the recovered organisms agglutinated with plague serum. This woman, from reliable evidence, had also not been out of the Philippine Islands during the past few years. At a near-by food store, where the woman is known to have purchased her food supply, four dead rats were found. These were taken to the Bureau of Science for diagnosis, but the *post-mortem* and inoculation experiments have proved negative.

The mortality rate for the city is rather below the normal, from which fact it may be inferred that no unrecognized cases are occurring. Three rat-catching gangs have been put to work with the object of catching as many rats as possible in the vicinities in which the patients died, and from other sections which are considered suspicious. So far, all of the rats found have proved negative. From the foregoing it is evident that there is no reliable information regarding the origin of the disease.

It is possible that the disease has been introduced by infected fleas, although, in view of recent cases reported by McCoy in Hawaii, and by observers in India, food infection cannot be completely disregarded. If the disease was introduced by infected fleas it would seem most likely that they reached here on sick rats which came in cargo, like crates of onions potatoes, baskets of eggs, garlic, baskets of soy beans or similar food-stuffs which arrive almost daily, in large quantities, from China, Japan, and other plague-infected countries. Rats have actually been observed in such cargo, and it would not be at all impossible for an infected rat to have been introduced in this way. The officers of the Public Health and Marine Hospital Service located in Hongkong and Manila have long since recognized the danger of introducing plague in this way, but up to the present time it has been impossible to devise a practical method for entirely eliminating the danger from the introduction of rats in this manner without placing prohibitive restrictions upon commerce. The theory of the introduction of the plague by means of food is slightly supported by the fact that, at the autopsy of the first case ulcerated tonsils were found, but as no cultures were taken it is impossible to submit anything definite under this head.

Abstracts.

Abstracts of Papers read before the "Italian Pellagra Congress," Bergamo, September, 1912, and the "Second Triennial Pellagra Meeting," Columbia, U.S.A., October 3 to 5, 1912.

Pellagra.

By Professor R. Blanchard, Paris.

I have the honour to bring to the knowledge of the Congress a *résumé* of the official report sent by Dr. Vernesco, Director of the Preda Hospital in Craiova (Roumania), to the General Director of Public Health in Bucharest, concerning the after-effects of Nicolaïdi's serum in the treatment of pellagra.

Dr. Vernesco having been officially appointed by the Roumanian Government, tried Nicolaïdi's treatment during 1909 and 1911.

Thirty-three patients, all suffering from grave cutaneous, gastro-enteric and nervous symptoms, such as: erythema, pyrosis, profuse and fœtid diarrhœa, vertigo, buzzings in the ears, and hallucinations, were subjected to the cure. Some of the patients were completely unconscious. In all the general state was bad. Many of them could not even stand on their feet.

Twenty-three of these patients, after a course of treatment (eighteen to twenty-three injections), left the hospital completely cured. The others, after eight to twelve injections, insisted on leaving the hospital. Improvement was noticeable in all, however, and some were able even to return to their work.

All the symptoms presented by the patients disappeared after a short time, after eight to ten injections; the weight increased from 2, 4, 6, up to 9 kilos.

The same results were obtained in 1911, with seven patients. Six of these were completely cured; the seventh insisted on leaving the hospital, feeling remarkably improved after a treatment of fifteen days.

A certain number of patients (ten) with grave psychical phenomena were sent to the Insane Hospital at Craiova, and subjected there to the same cure, by Dr. Mileticiu, the director of this asylum. Nine left the asylum after twenty-two to twenty-five injections, and returned to their work; the tenth, afflicted with "paranoia," was not improved by the cure.

All the pellagrins subjected by Dr. Vernesco to a sufficient number of injections (eighteen to twenty), continue to-day, one to two years after the cure, to be in good health and able for their work. In those who had an insufficient number of injections, three recurrences have been observed.

Amongst the pellagrins with psychical symptoms cured by Dr. Mileticiu at the Insane Asylum, one had a relapse one year after the cure. Subjected again to the same treatment, he left the asylum after eighteen injections. The other eight pellagrins cured in the Asylum continue to-day, two years after the cure, to be in good health and able to work.

Dr. Vernesco affirms, in consequence, that Nicolaïdi's serotherapy is a treatment of high efficiency against pellagra, and insists on the satisfactory results obtained in the gravest cases, if the treatment is continued for a sufficient length of time. Twenty, twenty-two, or twenty-five injections are necessary, depending on the gravity of the case. Relapses are rare, and seem to be due to an insufficiency of the treatment.

Ulterior Results on Pellagrins, subjected in 1911 to Nicolaïdi's Serotherapeutic Cure.

By Dr. Umberto Grillo, Udine, Italy, and Dr. Emilio Maz.

In September, 1911, we tried some therapeutical experiments on pellagrins with Nicolaïdi's serum. The majority of the patients subjected to the cure were chosen from those afflicted with grave gastro-enteric and nervous symptoms and the concomitant general cachexia.

We promised in our last year's publication in the *Rivista Pellagrologica Italiana*, after a certain time, to report the result of this cure.

For this purpose we examined all the treated patients, last spring, when the pellagra symptoms usually reappear, and we did so also in August. The actual state of these patients is now reported, an account of the period passed from the cure till to-day having been kept.

Case 1.—B. Giuseppe, male, aged 47, was afflicted last year with grave gastro-enteric symptoms; two to twenty diarrhœic, profuse and fœtid stools per day, intense thirst, lips swollen, sensation of burning in stomach, with general prostration, difficult and spasmodic walk, notable emaciation with marked loss of flesh, inability to work in the fields, headache and sensorial troubles, fibrillary tremors of the tongue, hands and feet, diffused erythema, during the past five years, on back, hands and feet, and also on sides of neck.

Now, a year after the cure, the patient presents only a very slight erythema on the exposed parts of the hands, with a sensation of slight burning and fibrillary tremors of the tongue. All the other symptoms of last year have disappeared, and the patient can now work regularly. The result is considered satisfactory.

Case 2.—T. Giulia, female, aged 44; was afflicted last year with erythema on hands and feet, sensation of weakness, vertigo, buzzings in the ears, diarrhœa, headache, startled awakenings. Apart from these pellagra symptoms, the patient had also suffered from stomach troubles for five years.

A year after the cure, the patient though still emaciated, does not now present any erythema, there is no diarrhœa, nor any other symptoms due to pellagra. The nutrition is slightly improved. The result is considered fairly satisfactory.

Case 3.—S. Giuditta, female, aged 63. Was afflicted last year with definite desquamative erythema over the backs of her hands and feet; there was also a profuse fœtid diarrhœa, not influenced

by treatment; headache, lachrymation, blepharitis, buzzings in the ears, insufficient sleep, continuous vertigo, organic depression, and a feeling of great weakness.

A year after the cure the patient had erythema and slight diarrhœa for a short time, and a slight trace of the erythema still persists. The general nutrition is good. She does not feel any weakness, and affirms that she had obtained an important benefit from the serotherapic cure.

Case 4.—Z. Giulia, female, aged 43, was afflicted last year, at the moment of the cure, with desquamative erythema on the dorsal aspect of feet, diarrhœa, heaviness in stomach, craving for a great quantity of salt in her food, profuse fœtid diarrhœa, diminution of visual acuity, deficient nutrition, physical prostration, with inability to perform labour continuously. All these symptoms have returned every year for the last eight years.

A year after the cure the condition was as follows: Patient had erythema on the hands and forearms for a short time; she has gone on working and has always felt very well. No diarrhœa. Even in the spring, when the erythema appeared, the gastro-enteric functions remained regular. The general nutrition keeps good.

Case 5.—V. Teresa, female, aged 36, pellagra for the last ten years; erythema on hands and feet; every spring diarrhœa. During the last two years has been unable to work in the fields. Sensation of swelling and pain in stomach, appetite lacking, intense thirst, disordered taste. Nutrition diminished, organic exhaustion grave, unable to attend even to housework, becoming at once exhausted.

A year after the cure, condition of nutrition good; no erythema, no diarrhœa, no feeling of exhaustion; perfect general health. Resumed work again since the cure.

Case 6.—M. Clementina, female, aged 30, erythema, burning on hands and lips, intense thirst, burning in stomach, sensation of heaviness, frequent headaches, vertigo, could attend to housework but was soon tired.

The patient improved after the cure, and was able to return to work. A relapse, however, set in, which killed her.

Case 7.—M. Agnese, female, aged 31. Cutaneous phenomena, grave gastro-enteric symptoms such as pyrosis, lack of appetite, twenty to thirty diarrhœic stools per day; constant headache, insomnia, dreams, terrifying nightmares, continual vertigo; anæmia, emaciation, marked organic wasting, absolute incapacity to work, tiring at least effort.

A year after cure: General nutrition good. For a short time in spring had a slight erythema. Skin and mucous membranes improved in colour; works regularly. No subjective troubles. No trace of erythema, no pyrosis. Sometimes her digestion is a little laborious.

Case 8.—G. Maria, female, aged 40. For eight years, desquamative erythema on hands and feet, pyrosis, diarrhœa, two to three liquid fœtid stools per day; erosion of the mucosa of gums; continual headache, perspiration, burning of hands, frequent hallucinations, sight diminished, insomnia with troubled dreams, continual vertigo, fibrillary tremors in tongue and hands, weakness, denutrition, emaciation, sensation of profound physical prostration, incapacity for work.

All these symptoms disappeared after the cure, and the patient has gone back to work. This is considered an excellent result.

Case 9.—Bal. Giuseppe, male, aged 51. Eight to ten diarrhœic stools per day. In spite of treatment this has never ceased. Erythema on back of hands every spring. Loss of flesh, anæmia, diffused œdema in limbs and face. Skin and mucous membranes very pale, waxy, and dried; face swollen, unable to work last year in the fields. On account of his pronounced œdema he was recently obliged to remain in bed.

A year after the cure: No erythema, though this made a very short reappearance last spring. No diarrhœa, tongue normal, perfect general state. He works without feeling tired. Œdema gone, and no more intestinal troubles.

The results in the nine patients subjected to Nicolaïdi's serotherapy was found to be satisfactory, and the improvement has been maintained in eight of the cases. One case died in spite of the treatment, and one had a relapse. Case 9 perhaps did better than any of the others, and appears to be really cured.

The authors finally state that the cure is not a specific one, but it repairs the grave deficiency which the malady produces in the nutrition of the pellagrins. The most notable point about it is the way in which it cuts short the intestinal troubles. All their patients during and after the cure got the same kind of food and lived under the same hygienic conditions.

Two Cases of Pellagra, in Roumania, with Grave Nervous Symptoms, Cured in a Short Time with Nicolaïdi's Serum.

By Dr. Jean Nicolaïdi, Paris, France.

Case I.—Stef. Georg., male, aged 60, admitted into hospital on August 10, 1912. Pellagrin for six years. Every spring desquamative erythema on the face, head, and feet. Headache with noises in the head, exhaustion, diarrhœa, and burning in the stomach. Last spring, patient was admitted in the hospital, where he was subjected to the usual treatment, but without any result.

Present Status.—Last spring he had an extensive erythema on the head, face, and feet, much graver than the previous times. Severe headache with a feeling as if a fire was burning in his head. Continuous vertigo; sight diminished, hearing bad, continuous buzzings in ears. Exhaustion, unable to walk and even to stand on his feet; slight diarrhœa with burning in the stomach. Erythema and ulcerations on back of hands, feet and legs.

First injection: With 50 c.c. of Nicolaïdi's serum, August 12. August 14, 15, 16, second, third and fourth injection, same dose.

August 17.—Patient says that the sensation of burning and the fire in his head are diminished, also the fearful noise he always had in his head, but he still feels as if it were hot. The haziness he had before his eyes is less thick, but he always has the impression of a veil before them. He always has buzzings in the ears.

August 18 and 20.—Fifth and sixth injection of same dose.

August 21.—Burning in stomach less pronounced.

August 22, 23, 24.—Seventh, eighth and ninth injections of 50 c.c.

August 25.—Feels much better on the whole; his expression is calmer. He still complains of the hot feeling in the head.

August 26, 27, 28.—Tenth, eleventh and twelfth injection of same dose.

August 30.—Patient feels well. Erythema completely gone. Head no longer hot. Sight good. Burning and buzzings disappeared. Can walk, general state remarkably improved. Feels able to return to his work, and insists on leaving the hospital.

In this case the disappearance of all grave symptoms was obtained in a very short time—eighteen days—and with only twelve injections of the serum.

Case 2.—Maria Const. Gh., female, aged 58, admitted into hospital on August 8, 1912.

Patient completely unconscious, impossible to obtain any information.

Present Status.—Extensive erythema on face, hands, forearms, feet and legs, with numerous ulcerations. Face œdematous, swollen and staring eyes. Complete unconsciousness. Mutters in an incoherent manner; passes her urine and fæces under her. No diarrhœa.

August 12.—First injection of 50 c.c. of Nicolaïdi's serum.

August 14, 15, 16.—Second, third and fourth injection of the same dose.

August 17.—After these four injections the patient became quieter. Her face was not so swollen as it was when she arrived at the hospital, and she began to speak again in an intelligible manner.

August 18 and 20.—Fifth and sixth injection of the same dose.

August 21.—Patient again more conscious, but she still does not know how long she has been ill, nor how old she is. She remembers that she has a son called John. Control over bladder and rectum has returned. Says she feels better, but still has a burning pain in the body. Sleep calmer, appetite good.

August 22, 23 and 24.—Seventh, eighth and ninth injection of 50 c.c.

August 26.—The state of the patient has improved in every way, but the memory is not re-established. She does not remember anything about the past.

August 26, 27 and 28.—Tenth, eleventh and twelfth injection of same dose.

August 30.—Patient declares that she feels well. She has lost the burning feeling in the stomach, speaks well, and her memory has returned. The ulcerations on her hands and feet are almost cured.

September 1, 2, 3.—Thirteenth, fourteenth and fifteenth injection—same dose.

September 5.—Patient feels well. Appetite good. Answers clearly all questions put to her. Memory completely returned.

September 5, 6, 7.—Sixteenth, seventeenth and eighteenth injections—same dose.

September 8.—Progress maintained; face, hands and feet completely free of erythema and ulcerations. Expression quite calm. Answers questions well.

September 8, 9 and 10.—Nineteenth, twentieth and twenty-first injections, same dose.

After this the author gave some further injections to consolidate the cure. All the symptoms, which were in this case of a grave nature, disappeared then after twenty-eight injections; a most satisfactory result.

Tick Bite in British Columbia.[1]

By John L. Todd, M.D.,
Associate Professor of Parasitology, McGill University, Montreal.

A very fatal disease, with symptoms closely resembling those of typhus fever, occurs in some parts of Montana. The disease is known locally as spotted fever, or tick fever. It is called tick fever because it is transmitted by the bites of a tick. When it became known that this tick, *Dermacentor venustus*, exists in Southern British Columbia, inquiries were instituted with the object of learning whether the disease which it transmits in Montana also exists in Canada. With this object, letters were sent out in the middle of April last year to a number of doctors practising in Southern British Columbia. The replies received from them were so interesting that more letters were sent out to medical men in British Columbia and in the neighbouring states and provinces. Altogether two hundred and ten letters were sent out to ask physicians if instances of ill-effects following tick bites, or of a disease resembling spotted fever, had occurred in their practices. In all, forty replies were received. Many of those who replied had seen cases in which infection of the wound caused by a tick bite had been followed by local inflammation that was sometimes very severe. Six letters mentioned instances in which the bites of ticks had been followed by paresis, or paralysis, and, sometimes, by death. The symptoms reported in these cases are quite unlike those which occur in the tick fever of Montana.

Dr. S. B., Fernie, B.C. About 1898, at Rossland, two infants died in convulsions; wood ticks were found on the necks of both.

Dr. G. C. E., Rosedale, B.C. In June, 1910, a child aged 4 had almost complete paralysis of the legs. A large wood tick had been taken from

[1] From the *Canadian Medical Association Journal*, December, 1912.

the nape of the neck a few hours before the doctor's visit. After a purge and a few hours' rest the child completely recovered.

Dr. G. B. H., Creston, B.C. A girl aged 4 gradually lost the use of her legs, during two or three days, until she was unable to stand. A tick was removed from the nape of the neck, and within three days the child was well again.

Dr. G. B. H., Victoria, B.C. About 1900, at Nelson, B.C., a child aged 5 was bitten on the back of the head by a tick. The patient died in convulsions. Dr. H. is very certain that the wood tick causes symptoms, and that there is no possibility of confusing these symptoms with those caused by infantile paralysis.

Dr. C. M. K., Grand Forks, B.C. About 1904 a child aged 4 had complete paralysis of the legs and a lesser degree of paralysis of the arms. A wood tick was removed from the nape of the neck, and rapid recovery resulted. Dr. K. knows of two or three such cases.

Dr. O. M., Vernon, B.C. January, 1912. A healthy child, 3½ years old, had been perfectly well until two hours before examination; when the patient was seen there was no temperature and the pulse was normal, but the legs were almost completely paralyzed. The child could not stand, and the reflexes were gone. A tick was found, firmly attached to the base of the neck; it was removed. The paralysis continued during the day; next morning there was a slight improvement, and by the evening the child had recovered the use of her legs. Dr. N. also knows of an instance in which an adult complained of weakness of the legs after a tick bite on the back.

Dr. W. O. R., Nelson, B.C. About 1900 a child died suddenly with symptoms of acute ascending paralysis. After death a large tick was found at the nape of the neck. In 1901 a second child with the same symptoms died, after an illness of two days. A tick was found attached to the right temple. The knowledge of these two cases suggested the presence of a tick when a third child, previously very healthy, was seen, whose legs had been becoming weaker for two days. One was found at the nape of the neck; it was removed, and in two days the child was quite well again. On April 10, 1912, a little girl aged 3 had become paralyzed. The legs were completely paralyzed and the reflexes were gone; paresis of the arms was marked. Three ticks were removed from the nape of the neck, and the child recovered completely.

Dr. D. R. S., Vancouver, B.C. At Rossland a child aged 3 or 4 had paralysis of the legs with absence of reflexes. A tick was removed from the neck and the symptoms disappeared.

Judging from some of the letters received, a belief that the bites of ticks may cause paralysis is quite common in some parts of British Columbia.

A consideration of these reports makes it seem very probable to the author that severe symptoms may follow the bites of ticks in British Columbia. Children seem to be most affected. In them, paresis and paralysis of the extremities, especially of the legs, are the most constant symptoms; and when such symptoms are seen ticks are usually found about the patient's head.

Dr. Todd makes these notes public in the hope that they may induce physicians who have seen or who may see similar cases to publish their experiences; for it seems possible that an undescribed disease, caused by ticks, may occur in British Columbia. The subject demands investigation, and Dr. Todd would welcome information and material concerning it. Living ticks, removed from children in whom their bites had caused paralysis, would be especially valuable.

Notes and News.

PREVENTION OF DISEASE IN WEST AFRICA.

Metamorphosis of Filaria loa.

An important discovery has been made in West Africa by Dr. R. T. Leiper, Interim Wandsworth Scholar of the London School of Tropical Medicine. The Secretary of that institution has received the following telegram, dated December 27, from Dr. Leiper at Calabar:—

"The metamorphosis of *Filaria loa* has been proved to take place in the salivary glands in a fly belonging to the genus *Chrysops*."

This discovery is of great importance because of the large number of Europeans who become infected with this worm in West Africa. The effects are rarely fatal, but the parental worm travels under the skin, sometimes under the conjunctiva, and may in that position set up conjunctivitis. The commonest result is the so-called "Calabar swelling." This is due to the worm's migrations in the deeper parts of the limbs, in the muscles and round the tendons. The swellings are painful and impair movement, so that the victim may be unable to write or even to use his hands. The swellings rarely last for more than a few days, but often recur in the same or another part of the body. There is some reason to suspect that at times, when travelling inside the skull, they cause epileptiform convulsions. The importance of Dr. Leiper's discovery is that now science will be in a position to determine the conditions in which people become infected, and it is hoped to prevent such infection.

The members of the genus *Chrysops* are day-biting flies, and are very widely distributed not only in the Tropics, but also in temperate climates, even in the British Isles. It is expected that Dr. Leiper will be now able to show which species of *Chrysops* are the carriers, as it is known that *Filaria loa* is limited to West Africa. The embryos of *Filaria loa* are found in the blood only during the day time, and are therefore called *Microfilaria diurna* by some in distinction from *Filaria bancrofti*, the cause of elephantiasis, whose embryos are found in the blood only during the night, and are known as *Microfilaria nocturna*. Sir Patrick Manson many years ago surmised that this nocturnal periodicit

pointed to a nocturnal blood-sucking insect as the intermediate host, and he proved that the intermediate hosts were certain species of mosquitoes. The diurnal periodicity of the embryos of *Filaria loa* suggested that the intermediate host was a day-biting insect, and Dr. Leiper has proved that the intermediate host of *Filaria loa* is a day-biting insect, a member of the genus *Chrysops*.

The Wandsworth Scholarship, the income of which has enabled the School to send Dr. Leiper, their helminthologist, to investigate the life history of the *Filaria loa* and other blood worms in man and animals, was placed at the disposal of the School about six months ago. The capital of the scholarship is a sum of £10,000, which was bequeathed by the late Lord Wandsworth to Sir William Bennett for purposes of research, and the latter placed the whole of the bequest at the disposal of the London School. Mr. Austen Chamberlain's appeal for £100,000 to place the School in a proper financial position has as one of its objects the provision of a sum sufficient to keep always in the field a research investigator. It may be recalled that Mr. Chamberlain was able to report at a recent meeting of a committee which has been formed to help him at the London Chamber of Commerce that more than half the amount for which he is appealing has now been received.—*The Times.*

More than forty varieties of rice are cultivated in Siam. The "hill" rice is a peculiar variety planted on the hillsides in Northern Siam, and is said to be marvellously productive. When ripe the ears of this rice are black, but when husked and boiled the grains are of a reddish colour, and have a peculiar fragrance. The "glutinous" rice is another variety, grown in the mountain valleys of Northern Siam, and forms the main food for the people of those regions, while white rice only is grown and used by the people on the plains of Lower Siam. A common kind of rice cultivated on land liable to floods during the rains is said to grow as much as a foot in twelve hours, so that the plant often attains a height of ten feet in its efforts to keep its leaves above water. The rice commonly grown in Siam consists of the so-called light crop, which is planted as early as February, and reaped in May or June, and the heavy crop, which is planted between July and September and harvested in December and January. Rice that is exported can be roughly divided into three classes—Na Muang, Pasak, and garden rice. Na Muang is the cheapest quality, and is grown chiefly in the district of Ayuthia. The grains are short, and have a great deal of red rice mixed with them, and they are also very much cracked, and therefore liable to be broken in milling. Pasak rice, which is of better quality than Na Muang, comes from the Pasak River district, and is a variety of golden rice. It is only due to the soil of this district that it is of poorer quality than the ordinary garden rice. The so-called garden rice forms the main bulk of rice that is exported, and is of the best quality. Na Muang and Pasak rice are used for mixing with it. This rice was formerly grown in the ditches of vegetable gardens, but is now grown on vast tracts of land, both by broadcast sowing and transplanting processes, so that the name garden has lost its original meaning.

The Diet of Mexicans.—The principal articles of food of the Mexicans are tortillas, tamales, enchilados and frijoles, and of these the tortilla takes first rank. It is made from corn (maize). The process is to allow a given measure of corn to soak for twelve hours in twice its bulk of strong lime-water, and the swollen grains are then washed in clean water. The corn is then put through a mashing process on a metate, which is a single piece of granite about 18 in. by 24 in., and of such shape that when held on the knee there is an easy incline from top to bottom, with a slight concave towards the centre over the entire surface. The stone is placed in a wide, shallow vessel, and with a stone pestle, called a "mano," the soft corn is rubbed up and down on the surface of the metate until there is a well and evenly kneaded mass. When sufficiently kneaded it is formed into thin cakes about 4 in. in diameter, which are then baked on an earthen plate called a "cornal." The poorer classes in Mexico use the tortilla not only as a food, but they make it serve also as spoon and fork. It is folded into a sort of scoop, and used in eating beans, thick soup, rice hash, or anything else usually lifted to the mouth with spoon or fork. Tortillas are considered a very nourishing article of diet, many labourers performing a long, hard day's work on a diet of tortillas, beans, and black coffee. Within the last few years machinery has been devised which grinds the lime-soaked corn.

In view of the spread of pellagra this diet is of interest. Soaking the grain in lime-water before grinding seems peculiar to Mexico.

The current quarterly issue of the *Bulletin of the Imperial Institute*, January, 1913, vol. x (1912), No. 4, contains reports of recent investigations by the scientific and technical department of the Institute, of which two are of special interest to the general reader: (1) An article on the cotton industry of Nyasaland, showing its great extension in the Protectorate and describing the evolution of a type of cotton which has now been acclimatized and is recognized as a distinct commercial variety under the name of Nyasaland Upland; and (2) an article on Bermuda arrowroot, which, in the laboratory tests at the Imperial Institute, has been shown to evince distinctive properties from some "Bermuda" arrowroots on the London market that are reputed to come from Bermuda. A special article, illustrated by a coloured plate, is contributed by Mr. Gerald C. Dudgeon, Director-General of the Department of Agriculture in Egypt, on the "Cotton-worm in Egypt," in which the correlation of the yield in cotton with the degree of severity of cotton-worm attacks is examined in detail. The

second part of an article on the "Coal Resources of the British Crown Colonies and Protectorates" is published; and there are other general notices respecting economic products and their development, among which is a comprehensive survey of the occurrence of bismuth ores, their distribution and utilization, throughout the world. The *Bulletin* concludes with some general notes, and with a summary of the contents of the more important papers and reports published during the preceding quarter, on subjects within its purview, and notices of recent literature.

MOTOR LAUNCHES FOR THE TROPICS.—The Bergius Launch and Engine Company, of Glasgow, make a speciality of launches suitable for tropical work. In their catalogue detailed descriptions are given of their Kelvin motor launches with diagrammatic plans, &c., so that intending purchasers may have everything before them. Many of the designs are particularly suitable for missionaries, planters, fishermen, pilots, and for other general purposes. The great advantage of motor launches, especially for tropical work, is obvious. The prices are very unwisely omitted from the catalogue.

A GUIDE TO PHOTOMICROGRAPHY.—Leitz issues a new guide to photomicrography. In view of the ever-extending utility of micrographic methods in all branches of scientific research the writer of the guide believes that this book will afford welcome assistance to many who are not sufficiently conversant with all the practical details of the method and photographic technique in general. Drawing upon the store of practical experience which he has collected in the course of years, the writer endeavours to explain in simple terms all that need be known respecting the treatment of the negative, its exposure, and development, as well as the preparation of paper prints and lantern slides. He has, moreover, thought it advisable to append a few short notes on the preparation of stereoscopic pictures, also on the use of the cinematograph attachment and dark-ground condenser for photographing living bacteria, and at the end of the book will be found directions for working by the autochrome process.

THE USE OF METALLURGICAL MICROSCOPES WITH CAMERA.—Metallurgical microscopes are designed upon principles which differ fundamentally from those determining the construction of microscopes used for biological and mineralogical research. This difference arises mainly from the fact that the metallurgist is solely concerned with opaque specimens of metals. In the standard type of microscope objects are studied by transmitted light, that is, by light passed through a transparent object or preparation with the aid of a mirror or condenser. On the other hand, metals and other metallurgical objects require to be illuminated by light brought to bear upon them by means of a mirror or prism in such a manner that it may pass by reflection at the object through the objective and so reach the eye or the camera. The appliances required to achieve this end in an efficient and practical manner involve a complete departure from the usual design of the prototype. In a series of directions issued by Leitz the various arrangements by which the apparatus is rendered available for work with lenses of different focal lengths and magnifications is dealt with separately, as the conditions of working vary considerably under these different circumstances.

Reviews.

THE INTERNAL SECRETORY ORGANS: THEIR PHYSIOLOGY AND PATHOLOGY. By Professor Dr. Artur Biedl, Vienna. With an Introductory Preface by Leonard Williams, M.D., M.R.C.P., Physician to the French Hospital; Assistant Physician to the Metropolitan Hospital. Translated by Linda Forster. London: John Bale, Sons and Danielsson, Ltd., Oxford House, 83-91, Great Titchfield Street, Oxford Street, W. 1913. All rights reserved.

As Dr. Williams says in his foreword, the subject of the Internal Secretions, or Glandular Physiology as it is sometimes called, is one which is destined to occupy the attention both of physiologists and clinicians for a long time to come. The subject, of course, is of the greatest importance, and all interested in it must be thankful to Professor Biedl for putting together all the facts, theory, and other work that has been done upon it into book form. The value of such a work is enormous, and the labour that must have been accomplished by the author in writing it may better be imagined than described.

The book is divided into two parts. Part I, General, and Part II, Special. In Part I, a brief account is given of the history of the doctrine of internal secretion, of its physiological basis, and of the general principles upon which the teaching is founded. In Part II the internal secretory organs are taken separately, and what is known of the nature and significance of their activities is described. In the present state of one's knowledge anything in the nature of a systematic classification is impossible. The only rational basis would be a morphological one, but this is rendered impossible by the insufficiency of the data at one's disposal. There is a general tendency to ascribe a specific activity to every cell-form and to every kind of tissue; but though, in a sense, one is justified in so doing, there is as yet no certain proof of the internal secretory activity of the greater number of cells and tissues. From the structure of a tissue the specific function possibly may be deduced, but that is a long way from being able to infer the nature of its chemical correlative function.

There are also drawbacks to a classification upon purely physiological grounds. In any such attempt organs and tissues of the most dissimilar type would, on account of the similarity of their function, be

classed together; while organs possessing activities in more than one direction would be included in several different groups.

Such being the state of matters the author has avoided all attempts at classification and simply gives a list of the internal secretory organs, taking them, as far as possible, in the order of their importance.

The so-called "vascular" or "ductless" glands are first dealt with, then the other internal secretory organs. The first group includes: The organs of the thyroid apparatus, namely, the thyroid gland and the parathyroid glands. The thymus gland. The two suprarenal systems, namely, the interrenal and the adrenal, together with the carotid and coccygeal glands. The hypophysis cerebri or pituitary gland, consisting of the anterior and posterior portions, together with the pineal gland. The spleen, which was formerly considered a vascular gland, is now regarded as essentially hæmatopoietic in its activity, its internal secretion having no great physiological significance.

The second group includes: The sexual glands and other tissues concerned in the processes of reproduction. The pancreas. The intestinal and gastric mucosa. The kidneys.

The questions of glycogenesis and the neutralizing activity of the liver are not entered into. These secretory functions are the oldest known and are fully described in the current text-books of physiology.

The plan adopted in each instance is: First, to give the necessary information concerning the morphology and the development of the organ; second, to describe in detail its physiological and experimental aspects; and finally, to estimate its pathological significance by means of material gained from clinical observation.

The book naturally is a long one—445 pages—while the literature covers another 141 pages, making the total 586 in all. The reference table, although very extensive, makes no pretension to include the entire literature of the subjects dealt with, the older literature, that anterior to about the middle of the last century, being omitted altogether.

The works are arranged, not according to subject, but under the authors' names, which are alphabetically placed, and the list is complete up to the end of the year 1909, a few publications for 1910 also being included. The above gives only a very imperfect account of this monumental work. People interested, of course, must read the original. The translation is a very good one, and very few verbal errors are to be found in the pages.

THE BRITISH JOURNAL OF TUBERCULOSIS. Edited by T. N. Kelynack, M.D.

The January number of this journal (vol. vii, No. 1, January, 1913) contains the following original articles: "Housing the Tuberculous Patient," by W. H. Scopes and M. M. Feustmann; "Carl Spengler's Views and Methods regarding Tuberculosis," by W. H. Fearis; "The Future of Dispensary and Domiciliary Management of Tuberculosis," by D. J. Williamson. Two critical reviews are also published, one on "Recent Advances in the Cultivation of the Tubercle Bacillus," by J. Cruickshank, the other on "Mixed and Secondary Infections in Pulmonary Tuberculosis," by J. A. Radcliffe. In addition to these a part is devoted to personal opinions, to institutions for the tuberculous, notices of books, preparations and appliances, and notes. The journal is published quarterly (single copies, 1s. 6d.; annual subscription, 5s. post free), Baillière, Tindall and Cox being the publishers. Many of the articles are illustrated by photographs. The difficulty for a journal of this sort will be the getting of good original communications. Given these, however, then it should do well.

A CLINICAL SYSTEM OF TUBERCULOSIS, DESCRIBING ALL FORMS OF THE DISEASE. By Dr. B. Bandelier, Medical Director to the Sanatorium Schwarzwaldheim at Schömberg, near Wildbad, and Dr. O. Roepke, Medical Director to the Sanatorium for Railway Workers at Stadtwald in Melsungen, near Cassel. Translated from the Second German Edition by G. Bertram Hunt, M.D., B.S., late Physician to the Scarborough Hospital. London: John Bale, Sons and Danielsson, Ltd., 83-91, Great Titchfield Street, Oxford Street, W. Copyright. 1913.

This is a very valuable work on the subject of tuberculosis, and it has this great advantage, that the whole subject is dealt with together in one volume. Whatever aspect of the disease, therefore, one wishes to read about, surgical tubercle, medical tubercle, tubercle of the special senses, &c., will be found within its pages. The present edition (the second) has not been altered in form, but the latest discoveries and most recent views on the subject have been incorporated in the various chapters. Several of these, on tuberculosis of the upper air passages, the blood and lymphatic systems, the digestive organs, the skin, and the nervous systems have been rewritten, while others, such as the climatic and surgical treatment of pulmonary tuberculosis, tuberculosis of the kidney, bladder, tonsil, throat, and larynx have been considerably increased.

New schematic charts for recording the condition of the lungs and new temperature charts have been added, and sections on tuberculosis of the gall-bladder, Hodgkin's disease, the tubercular psychoses and mental states, make their first appearance.

Plates on the bacteriological diagnoses, and on the pathological anatomy of tuberculosis of the lungs and larynx from Koch's work "On the Etiology of Tuberculosis" have been added by request. The first edition of the book was very favourably received both in Germany and other countries, and there is no doubt that the second edition will share the same fate. Having this edition translated into English will make the work available to the medical profession in England

generally, and this, of course, should enormously increase the circulation and sale of the book. One can confidently recommend the work to all interested in the subject of tuberculosis. It is a gold mine of information, and nothing, even of the slightest importance, is omitted. A translation has also been made into Spanish, which still further indicates its popularity.

ANNUAL REPORT ON THE RESULTS OF TUBERCULOSIS RESEARCH, 1911. By Dr. F. Köhler, Head Physician of the Holsterhausen Sanatorium, near Werden on the Ruhr. Reprint from the "Clinical Year-book," edited by Dr. Naumann and Dr. M. Kirchner. Vol. 26. Translated by Ronald E. S. Krohn, M.D.Lond. London: John Bale, Sons and Danielsson, Ltd., Oxford House, 83-91, Great Titchfield Street, Oxford Street, W. 1913.

The author states that the friendly reception accorded by numerous readers to the "Annual Report on the Results of Tuberculosis Research in 1910," published last year, is his justification for continuing the work then begun, and now submitting a synopsis of the most important works that have appeared during 1911. The report is larger this year, because more space has been allotted for each review, and also owing to the fact that the literature of the subject increases year by year. As the translator mentions, it is to be regretted that the report now submitted is on the work done in 1911, but the delay has been unavoidable. The book, with the index, runs to 245 pages, and is divided up into the following sections: (1) General, (2) Distribution, (3) Etiology, (4) Pathology, (5) Diagnosis, (6) Prophylaxis and Treatment, (7) Index of Authors, (8) General Index. Such a synopsis must prove invaluable to all workers on tuberculosis, and an English translation is a very sound scheme.

THE ETIOLOGY OF ENDEMIC GOITRE.—Being the Milroy Lectures delivered at the Royal College of Physicians of London in January, 1913. By Robert McCarrison, M.D., R.U.I., M.R.C.P.Lond., Major, Indian Medical Service. Illustrated. London: John Bale, Sons and Danielsson, Ltd., Oxford House, 83-91, Great Titchfield Street, Oxford Street, W. 1913.

The Etiology of Endemic Goitre is one that has puzzled many observers in the past, and will probably continue to do so in the future. Major McCarrison's Milroy Lectures, written up into book form, will now, however, provide those interested in the subject with a readily accessible record of the extent of the present-day knowledge of the causation of the disease. A most striking discovery is, undoubtedly, that of Chagas, in Brazil, who shows that many of the goitres of that country are due to a trypanosome, the *Schizotrypanum Cruzi*. This parasite apparently produces many lesions in its human host, one of these being this form of goitre, called now by Chagas *Parasitic thyroiditis*.

In the light of these discoveries the etiology of endemic goitres in other areas requires careful revision. Vianna's researches show that the trypanosome in its later stages disappears from the blood and becomes a tissue parasite, so that an absence of such parasites from the peripheral blood in a chronic case of goitre is not sufficient to say that they might not have been there at some previous time, and have really been the cause of the condition. The book is well illustrated with many very excellent photographs, and it should prove both interesting and instructive to those who read it. Major McCarrison has made the subject of goitre his special study, and the many observations of his own contained in the pages of the book show how much valuable work he has done on the subject.

A SYSTEM OF SURGERY. Edited by G. C. Choyce, B.Sc., M.D., F.R.C.S.; Dean of, and Teacher of Operative Surgery in the London School of Clinical Medicine; Surgeon to the Seamen's Hospital, Greenwich; Surgeon to Out-patients at the Great Northern Central Hospital. Pathological Editor, J. Martin Beattie, M.A., M.D., C.M.; Professor of Bacteriology in the University of Liverpool, and Bacteriologist to the City of Liverpool; formerly Professor of Pathology and Bacteriology, and Dean of the Faculty of Medicine, in the University of Sheffield; Hon. Pathologist to the Sheffield Royal Infirmary and Royal Hospital. In three volumes. Volume II. With eighteen colour plates, eight black and white plates, and 375 illustrations in the text. Cassell and Company, Ltd., London, New York, Toronto, and Melbourne. 1912.

This, the second volume of Choyce's System of Surgery, contains the following articles: The breast, by W. S. Handley; the spleen, by C. G. Watson; malformations of the face, lips, and palate, by C. A. R. Nitch; the tongue, by W. H. Clayton-Greene; the salivary glands and floor of the mouth, by I. Back; the œsophagus, by H. M. Rigby; the stomach and duodenum, by J. Sherren; the intestines, by A. Miles; the appendix and peritoneum, by P. Sargent; hernia, by L. McGavin; the rectum and anal canal, by H. S. Clogg; the liver, gall-bladder, bile passages, and pancreas, by G. G. Turner; the upper and lower urinary tract, by J. W. Thomson Walker; the male genital tract, by R. Howard; and the female genital tract, by V. Bonney. All these subjects, treated as they are by specialists, in many instances of the individual subject itself, are suitably dealt with.

One of the main features of the work is the splendid way in which it is illustrated, there being no fewer than eighteen coloured plates, while eight black and white plates and 375 illustrations are also to be found in the text. These greatly enhance the value of this very excellent system. For those surgically inclined no better work could be in their hands. The next volume, the third, will complete the system.

Personal Notes.

INDIA OFFICE.

From November 23 to January 25.

Arrivals Reported in London.—Captain W. T. Finlayson, I.M.S.; Captain J. Taylor, I.M.S.; Captain R. D. Willcocks, I.M.S.; Colonel H. St. C. Carruthers, I.M.S.; Lieutenant-Colonel S. H. Henderson, I.M.S.; Major E. R. Rost, I.M.S.; Captain J. J. Robb, I.M.S.; Lieutenant-Colonel E. A. W. Hall, I.M.S.; Captain L. Reynolds, I.M.S.; Captain E. S. Phipson, I.M.S.; Lieutenant-Colonel W. H. B. Robinson, I.M.S.; Major L. P. Stephen, I.M.S.; Captain G. L. C. Little, I.M.S.; Major F. H. G. Hutchinson, I.M.S.; Lieutenant-Colonel R. H. Castor, I.M.S.; Lieutenant-Colonel W. Molesworth, I.M.S.; Major C. D. Dawes, I.M.S.; Captain J. J. H. Nelson, I.M.S.; Lieutenant-Colonel W. G. Pridmore, I.M.S.; Captain J. T. Parkinson, I.S.M.D.; Captain L. Hirsch, I.M.S.

EXTENSIONS OF LEAVE.

Captain P. M. Rennie, I.M.S., 5 m.; Major G. Y. C. Hunter, I.M.S., 6 m. M.C.; Major M. Mackelvie, I.M.S., 7 m.; Captain J. H. Horton, *D.S.O.*, I.M.S., to June 21, 1913; Major J. W. D. Megaw, I.M.S., 14 days; Lieutenant J. F. H. Morgan, I.M.S., to March 10, 1913; Lieutenant V. P. Norman, I.M.S., 6 m. M.C.; Major C. B. Harrison, I.M.S., 4 m. M.C.; Major P. P. Kilkelly, I.M.S., 6 m. M.C.; Captain G. Fowler, I.M.S., 4 m. M.C.; Major G. Browse, I.M.S., 10 days; Captain N. N. G. C. McVean, I.M.S., 6 m.

PERMITTED TO RETURN.

Captain F. C. Rogers, I.M.S.; Captain J. T. Parkinson, I.S.M.D.; Captain J. Smalley, I.M.S.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Bamfield, Major H., I.M.S., 17 m., from April 19, 1912.
Bidie, Major G., I.M.S., 12 m., from June, 1912.
Boyd, Captain T. C., I.M.S. 1 y., to March 19, 1913.
Browse, Major G., I.M.S., to April 7, 1913.
Corkery, Colonel W. A., I.M.S., P.M.O., 3rd Lahore Division.
Davys, Captain G. I., I.M.S., to January 31, 1913.
Dawes, Major C. D., I.M.S., to December 24, 1913.
Graves, Lieutenant-Colonel D. H., I.M.S.
Hamilton, Major J. A., I.M.S., to December 19, 1913.
Kerans, Captain G. C. L., I.M.S., 1 y., from April 5, 1912.
Little, Captain G. L. C., I.M.S.
Malcolmson, Captain G. S., I.M.S., 18 m., from May 6, 1912.
Middleton-West, Captain S. H., I.M.S.
Morgan, Lieutenant J. F. H., I.M.S., to January 31, 1913.
Nelson, Captain J. J. H. I.M.S.
Napier, Captain A. H., I.M.S., to April 15, 1913.
Norman, Lieutenant V.P., I.M.S., 21 m., from November 15, 1911.
Phipson, Captain G. S., I.M.S., to November 19, 1913.
Reynolds, Captain L., I.M.S., to May 6, 1913.
Stephen, Major L. P., I.M.S.
Stewart, Captain A. D., I.M.S., to October 1, 1914.
Thompson, Captain F. T., I.M.S., 18 m., from December 16, 1911.
Willcocks, Captain R. D., I.M.S.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Carruthers, Colonel H. St. C., I.M.S., Burma, 7 m. 21 d., November 9, 1912.
Chapman, Major P. F., I.M.S., C.P., 18 m., April 2, 1912.
Connor, Captain F. P., I.M.S., Behar and Orissa, 18 m., April 30, 1912.
Crump, Captain S. T., I.M.S., 6 m., August 16, 1912.
Dick, Major M., I.M.S., Burma, 18 m. 8 d., August 5, 1912.
Edwards, Lieutenant-Colonel W. R., C.M.G., D.S.O., I.M.S., India Foreign, 17 m., 23 d., October 9, 1911.
Finlayson, Captain W. T., I.M.S., Punjab, 24 m., October 24, 1912.
Fowler, Captain G., I.M.S., C.P., 16 m., March 1, 1912.
Hall, Lieutenant-Colonel E. A. W., I.M.S., B., 24 m., October 25, 1912.
Henderson, Lieutenant-Colonel S. H., I.M.S., U. P. Prisons, 18 m., November 4, 1912.
Hingston, Captain C. A. F., I.M.S., M., 6 m. 16 d., October 23, 1912.
Hutchinson, Major F. H. G., I.M.S.
Kilkelly, Major P. P., I.M.S., Bo., 30 m., March 13, 1911.
Knapp, Captain H. H. G., I.M.S., Burma Gaols, 17 m. 25 d. June 26, 1912.
Lethbridge, Major W., I.M.S., Rajpootana.
MacKelvie, Major M., I.M.S., B., 19 m., November 18, 1911.
Molesworth, Lieutenant-Colonel W., I.M.S., M.
Nutt, Captain H. R., I.M.S., U.P., 12 m., September 19, 1912.
Robb, Captain J. J., I.M.S., M. Gaols, 11 m. 15 d., November 11, 1912.
Robinson, Lieutenant-Colonel W. H. B., I.M.S., 12 m., November 7, 1912.
Rogers, Captain F. C., I.M.S., M., 16 m. 14 d., December 6, 1911.
Rost, Major E. R., I.M.S., Burma, 24 m., November 11, 1912.
Steen, Captain H. B., I.M.S., B., 19 m., August 23, 1912.
Stephen, Major L. P., I.M.S., 12 m. 13 d., August 17, 1912.
Taylor, Captain J., I.M.S., Plague Research Comm., India.
Ward, Major E. L., I.M.S., Punjab Gaols, 12 m., June 10, 1912.
Weinman, Major C. F., I.M.S., B., 13 m. 14 d., October 3, 1912.
Whitmore, Captain A., I.M.S., Burma, 12 m., February 8, 1912.
Willcocks, Captain R. D., I.M.S., M., 12 m., October 10, 1912.

"Annales d'Hygiène et de Médécine Coloniales," 1912, xv, 3.

The Etiology of Beriberi. Gouzien, from a study of the records in regard to beriberi in the penitentiary at Hanoi in French China from 1906 to 1910, concludes that rice undoubtedly plays a very important part in the pathogenesis of the disease, but that the superiority of the unpolished to the polished rice does not lie in any antitoxic effect of the husks but in the fact that they protect the grain against degeneration from heat and moisture. He believes that the disease is an intoxication, and not an infection. In support of this theory he cites the fact that a very severe epidemic of beriberi was followed by an epidemic of scurvy, the latter disease attacking only those who had been affected by the former. According to him, the two diseases seem to be in a sense interchangeable. Moreover, even when polished rice of the same quality is used, marked decrease is noted in the epidemic when the diet is varied by a free use of fresh vegetables, fruits and meat. In addition to the dietetic factors, overcrowding and dampness seem to play an important part in the course and severity of the disease.

"Bulletin de la Société Medico-Chirurgicale de L'Indochine," Tome iii, December, 1912, No. 10.

Liver Abscess due to Ascaris lumbricoides.—Degorce reports an interesting case of a child, aged 7, who was admitted into the Hospital at Hanoi suffering from severe pains in the abdomen. Peritonitis soon developed with a high temperature, and the child sank and died. The autopsy revealed the fact that the liver was invaded by numerous *Ascaris lumbricoides* which had caused multiple abscesses, peritonitis following, and so death. A very clear figure of the liver shows the invasion of the ascarides and the multiple abscesses.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

CLIMATE AND OTHER FACTORS IN RELATION TO THE HEALTH OF EUROPEANS IN CHINA.

By Dr. JAMES GRIEVE CORMACK,

London Missionary Society, Hankow, China.

THE climate of China is as varied as that found throughout the length and breadth of Europe. In the north, especially Chihli and Manchuria, the winters are semi-arctic in their severity, while in Southern China the summers are semi-tropical or tropical in their intensity; hence in speaking of climate in China in its bearings upon health, one must ever keep in mind the part of the country he is dealing with.

It has been my fortune to spend about eight years in Western China in the Province of Szechuan, the richest and most fertile, and in regard to climate something like that of Italy or Spain. Then I have had a year and a half's experience of Eastern China in the city of Shanghai and neighbourhood; four years in Central China in and near Hankow; and latterly, eighteen months in North China in the city of Peking, while I have journeyed for about three months in the north-west of China. Of Southern China I have no experience but that of the traveller who passes round the coast of China on his way to Shanghai.

Briefly stated, the climate of North China is dry, sandy, very cold in winter, and trying to people of neurotic temperament. The summers are not particularly trying. Typhus fever is much more prevalent throughout Northern China than other parts. Typhoid fever is rarely met with, and malaria is not very common.

Central and Western China.—The climate is moist, humid, with mild open winters, except in the hilly districts of West China; the snow-fall is very slight, malaria is very prevalent, and epidemics of cholera, dysentery, and relapsing fever are of frequent occurrence.

Eastern China, generally speaking, is more bracing from its nearer contact to the sea, but in many districts, such as the Province of Chehkiang, where much rice is grown, malaria is very prevalent.

Southern China, except in high-lying districts, is usually very trying during the summer, but spring, autumn, and winter is often delightful.

It is difficult to state with confidence that the climate of China exerts a great influence on the health of Europeans, but the changed conditions and environment in which missionaries and others away from the great open ports have to spend their lives is undoubtedly a very important factor. With care in not exposing themselves to the sun in the semi-tropical parts of China, Europeans will find the climate of that great land is not less healthy than Europe. Of course there are special risks from epidemic diseases which are all too prevalent in a land where sanitation is practically unstudied, yet the real factors affecting the health of Europeans arise rather from the habits and customs of the Chinese people, together with the conditions of isolation from one's own countrymen and friends. Repeated strain upon the nervous system, incident to life among an alien people, where often the wildest rumours gain currency and may lead to riot, rebellion, or other uprising, is also furnished by the carelessness of the people during epidemics of small-pox, cholera, &c.

The other Factors.—As the other factors appear to me the most important in relation to the health of Europeans, I wish to speak of some of them under the following headings:—

Food, dwellings, exercise, companionship, isolation, idiosyncrasy of temperament; special factors peculiar to men and women.

The Food Factor.—Throughout almost the whole of China a plentiful supply of food, both animal and vegetable, fruit, and fish can be obtained; though at certain seasons in many of the interior cities it is frequently difficult to obtain beef or mutton.

The quality, however, of the food is often coarse and poor, and many Europeans prefer to use tinned provisions, and flour and cereals brought from abroad, because of their better quality.

One of the great dangers to health arises from the mode of vegetable cultivation in China. The Chinese market gardener manures his fields most diligently, using chiefly a fluid mixture of urine and fæces gathered from all the latrines of the cities. He has learned by practical experience the richness in nitrates of human manure, and what we in this country cast into the sea or at best use for sewage farms for cultivating grass for cattle and horses, the Chinaman collects most carefully from the houses of every street and lane and carries to his sewage tank, where it is carefully stored and used during the spring and summer to manure his garden and fields.

It will be readily understood that vegetables produced under such conditions are a source of very great danger. Probably 75 per cent. of the Chinese suffer from round worms, consequently the millions of ova which are scattered over the growing vegetables as the Chinaman ladles the liquid contents of his sewage tank on to them, produce a vicious circle of helminth infection.

Besides the round worm, *Schistosomum japonicum*, and ankylostomes or hook-worm infection is frequently met with, and I believe the source of this infection may be traced to this method of vegetable cultivation, and to the habit the Chinese have of *washing* their vegetables in the stream and river before taking them to market, thus infecting the drinking water.

Curiously enough, though there is more pork eaten in China than among any other nation in the world, tape-worm infection is not as frequently seen as one might expect; this I attribute to the fact that the Chinese cook their pork thoroughly and probably kill the tape-worm ova where present. From the foregoing, it will at once be gathered that

Europeans living in China should avoid all uncooked vegetables and unboiled water; salads, I think, are especially dangerous.

Milk.—There are few places in China where it is ever safe to drink unboiled milk, for besides the risk arising from contamination by air-borne particles, there is the very serious danger that unboiled water from doubtful sources has been added to it by the not overscrupulous milkman; at other times he will add a solution of bean curd, and the specific gravity of the milk will be enhanced thereby so that dependence on the lactometer gives no clue to the milk not having been tampered with.

In the case where infants are being hand-fed, the danger of serious mischief being started by the use of such milk cannot be over-estimated; in fact, I much prefer to depend on a really good brand of condensed milk rather than risk the many dangers arising from the use of milk obtained from Chinese sources. In this connection, I think it right to state that I have seen remarkable recoveries in young infants who were gradually going down from the use of milk from Chinese sources or from the use of an inferior brand of tinned milk, when "Bear Brand" or Nestlé's Swiss Milk was substituted and used along with Mellin's Food. My rule for the past five years has been to confine myself to unsweetened "Bear Brand" milk, and the freedom of our family from digestive disturbances is partly at least due to this.

Water Supply.—Equal risks arise from the water supply, whether it be from well or river. My rule is never to drink unboiled water, no matter what filter it has passed through; in fact, I much prefer the simple home-made filter, which can be got for the matter of 6d. or 1s., to any of the many carbon filters one sees in so many houses of Europeans abroad. A Berkefeld filter, of course, is very good, but unless the lady of the house attends to it herself and sees to the renewal and cleansing of the candles, it, too, may become a source of danger.

Dwellings as a Factor.—In all open ports and large cities in China, the European usually builds his house in foreign or semi-foreign style, with suitable verandahs, but in many of the interior cities to which missionaries and others have gone, this is either not possible or impolitic, and they have frequently to adapt native-built houses. Now these houses can be made most comfortable and healthful; but, as in most parts they are single storied and have paved or mud floors and may be built in busy streets, in close proximity to other native houses, lacking in light and air, and with no cheering outlook on any landscape, they are often most depressing, especially when the ladies are unable to go out on to the street or walls of the city for exercise. One is not surprised if a lady finds life somewhat trying shut up in one of these Chinese houses for several months on end, with perhaps little room for a walk, except round a small courtyard within their dwelling.

In spite of what has been written regarding malarial infection, it is the exception and not the rule to find houses mosquito-netted in China. Many Europeans are content to sleep under mosquito curtains rather than go to the trouble of providing mosquito-netted rooms or houses, though the difference in the actual cost of the two methods is really not so great as some think, and the comfort and safety of the mosquito-netted house method needs to be experienced to be fully appreciated.

Exercise.—I have already hinted in the paragraph on dwellings that exercise in one of the interior cities of China is often difficult to obtain, and ladies and children especially suffer because of the narrowness of their surroundings and the lack of change. Too often the city wall may be the only place where one can get a fair walk and the pleasure of that is often spoiled because of the curious onlooker and children who may wish to follow the foreigner around. Consequently, we must often depend upon what can be got within our own gates if we wish to be free from curious intrusions. Where there is room for a tennis court or croquet lawn, this want will not be felt so much.

Apart, however, from opportunity of exercise and recreation, in the hot weather especially there is no inclination for it, or during the multitudinous claims of duty, time is not taken for it.

Want of change of scene and suitable relaxation may frequently produce a feeling of depression and weariness, that is the mental attitude inviting disease and ill-health. The fact that the surroundings are so uninviting or circumscribed deters one from an effort to obtain exercise, though everyone is theoretically persuaded of its desirability.

Exercise for health reasons seems not to have occurred to Chinese, and there is no provision for active recreation and sports, except what has been introduced by mission schools and colleges, or more recently by imitation of the West.

Companionship and Isolation as a Factor.—The isolation that many Europeans, both in mission, postal and Government service, undergo in inland China is a most important factor in relation to their health, and with this isolation must be associated suitable and unsuitable companionship; in the one case mitigating the evil, in the other intensifying it.

Added to the loneliness we must also remember that there is frequently considerable nervous strain from the wild rumours so frequently circulated and threatenings of riots. Such occurrences as these, happening in many cases once or twice a year, leave their mark upon the strongest, much in the same way that anxiety in the case of friends nursing those they love leads sometimes to a nervous breakdown.

If, in addition to the loneliness and isolation, the number of Europeans at any station should be very small and people of unsuitable temperament be constantly together, it also may be, and I believe is a factor making for ill-health. It is for this reason that a good holiday in the summer is essential to the lonely worker, not only because it allows him or her to get away from his surroundings, but also because it often gives a great oppor-

tunity to meet many friends and acquaintances from other parts of the field with whom one may have much social interchange.

Idiosyncrasy of Temperament.—Closely associated with companionship and isolation we must place personal idiosyncrasy of temperament. Many people of bright, happy, social dispositions settle in so happily with the Chinese that they do not feel any sense of loneliness, and even the strain of a riot may not upset them much; but to others the long separation from the homeland and its many social joys is a great privation, and though possessed of real bravery of spirit and a determination to fulfil their duty and stick to their work, do so, however, with expenditure of great nervous energy, and I fear some of the breakdowns that occur may be traced not to the climate, however relaxing and hot that may be, but rather to the effect of changed environment and difficult surroundings upon sensitive and highly-strung dispositions.

The mental attitude is a powerful factor in bringing about recovery; it is equally powerful in producing a state which leads to disease, if it does not actually cause it.

Special Features peculiar to Men.—Isolation and loneliness is much less felt by men than women, because they can move about much more freely among the people, but they often run greater risks than women because they journey more, and are less careful about food and water and sleeping in inns, boats, or other places where they are more exposed to infectious troubles. The two extremes are also met with in men who are so careful of their health that they are always doctoring and drugging themselves (often with the scantiest knowledge of medicine), others who are so careless that they allow serious symptoms of disease to go on for long periods without seeking medical aid.

Cases of sore mouth and morning diarrhœa may, for example, go on for months without the person being aware that he is in a serious condition and threatened with sprue, or a severe condition of chronic constipation and a toxæmia from intestinal stasis may continue for long periods without the European realizing what ails him; probably he puts the feeling of tiredness down to "climate," or some other such vague term.

It need hardly be mentioned, too, that the heat of the Chinese summers increases the temptation to take alcoholic stimulants, and also there is a greater tendency among foreigners in the East to overeat in the matter of meat diet, men being greater sinners in this respect than women.

Special Features peculiar to Women.—Besides the factors in the foregoing common to both men and women, there are a number which have a direct bearing upon the health of women which are incident to their sexual life, such as *menstruation*, *pregnancy*, *puerperium*, and other *mental conditions* associated therewith. Along with these must be included the *question of marriage* immediately before sailing for China, or on arrival there.

To take these in order then: From inquiries I have made it seems that the *menstrual function* is undoubtedly influenced in the majority of cases by the changed conditions of life in China from those prevailing at home. In some cases the *menstrual flow* seems to be increased in amount and duration; in other cases it is accompanied by pain in subjects who were free from pain at home. *Climatic conditions* may have a certain effect in bringing this about, though I am inclined to think it is the sum total of all the factors making up the changed environment, rather than the single one included in the word climate.

Pregnancy.—While in the majority of cases pregnancy proceeds in its normal course, the tendency to abortion is perhaps more frequent in China, and there seem to be few ladies who have borne several children who have not a story to tell of at least one abortion.

Hence, there is more need for a word of caution to ladies abroad to be even more careful during pregnancy than they would be at home, and especially to avoid the jolting associated with sedan-chair riding and cart riding, which are two of the great means of travel in inland China.

Of the *puerperium*, one need only remark that in Western, Central and Southern China, the semi-tropical heat of spring and summer lead to a very abundant growth of all forms of vegetable and parasitic life, and we can presume that pathogenic organisms share to a great extent in this exuberant growth, hence the risk of puerperal infection is somewhat increased, and where it occurs it tends to be very virulent.

Mental Conditions.—Women, I am sure, are more seriously affected than men by the changed environment incident to residence in China. We have often noted women who, when in the homeland were joyful and happy in Christian and social work, after a short residence in China become morose, suspicious, jealous, and uncompanionable, or else subject to morbid fancies and easily taking offence at supposed slights. A year or eighteen months of this kind of strain, and all the spring has gone out of the life and a serious breakdown can only be prevented by a change to the homeland, where the freer, fuller conditions of life soon bring back normal health.

The Marriage Factor.—The seriousness of this question from the point of view of health of women who hope to reside in China is one that medical men should study and form an opinion on, which should be clearly stated to the various Mission Boards, who more than others have the responsibility of sending out women to the foreign field.

Broadly speaking, three methods are at present followed:—

(1) To allow people to get married and set out for their sphere of service almost immediately.

(2) To allow the lady to go out to her *fiancé* and get married immediately on arrival on foreign soil.

(3) To send out the young lady and have her spend a definite period of from one to two years on the field before her marriage.

Each of these methods has strong advocates, but I doubt if the medical point of view has been as fully considered and presented as it should be.

First Method.—A little consideration will, I am sure, bring home to us the very great risk attaching to the first method. Think what it means to a woman to enter the married state and in addition to the possible strain incurred in an early first pregnancy, to have the discomfort of a sea voyage of six weeks' duration. Then the landing in a new country, with all the difficulties incident to setting up a home there, ignorant of the language and customs of the people, and passing through the trials of accommodating herself to her changed environment, while at the same time the strain of a first pregnancy with its hopes and fears is gone through.

My conviction, after over twenty years of observation, is that it is an experiment fraught with danger to the woman's health and happiness, and a tremendous handicap to her learning the language, and so settling comfortably to her future life's work, and too often ends in both husband's and wife's retiral from missionary service.

Second Method.—Little can be urged for this method in preference to the first, except that the sea voyage may have brought the young lady out to her new home in excellent health, having had no strain upon her physically from the possible changes that accompany conception and early pregnancy. The other factors, however, remain unchanged, the new environment, the strange people, the restricted conditions of life, must be begun along with the very important new relation in her sexual life.

Ten chances to one, the pressing cares of housekeeping prevent her getting time for study of the language, and the lady remains throughout life in China very much outside Chinese ways and customs, and feels keenly throughout all her experience an alien and an exile in a strange land. True, she may say that she came to be her husband's companion and help, and not to do missionary work; he will, in the nature of the case, have often to undertake home duties to assist his wife's deficiency in the knowledge of the language, and she will probably feel more than ever that she is not mistress in her own home, and is often burdensome to her husband from having to ask him to attend to domestic matters that should naturally be hers. It need hardly be added that such conditions make an extra call upon her mental outlook, and I fear sometimes cause discontent with her lot which might have been obviated by six months' residence in the land, acquiring a knowledge of the people and language before setting up her own home. Who shall deny that such conditions frequently lead to ill-health or an early furlough?

Third Method.—From the point of view of future good health and usefulness, I believe strongly that the third method is the best. Let the lady become accustomed to Chinese life and conditions, acclimatized to the new land and free from the early difficulties associated therewith, and then get married. If such a course is followed then marriage, as it affects the health of women, presents no other difficulties than what are met with in the homeland.

A carefully conducted investigation by medical men into these factors, will, I feel sure, substantiate my views on this subject, and might lead to the formation of rules and regulations for the time of marriage at least for missionaries in China, and might materially help in preventing much of the ill-health and breakdowns that have so often been seen. Very much more might be said, but if these few statements set the ball rolling and provoke questions and discussion, I think some good may eventuate.

In conclusion, let me apologize for the very slight way in which I have been able to touch this very wide subject. It is so very extensive in its range, I fear it has led me to a mere glancing at some of its parts, and to none of them do I feel I have done justice, but some hints may have been dropped that may guide in future investigations; and if that is so, I shall feel this short paper has not been written in vain.

TROPICAL DISEASES IN TRIPOLI.

By Professor Umberto Gabbi.

Rome.

In the year 1910, I was charged by my Government (Home Office, General Direction of the Public Health) to study the diseases of infection predominating among our colonists established in Tripoli. In conjunction with Dr. Visentini I succeeded in ascertaining the existence of Mediterranean fever (not only in the inhabitants, but also in the Maltese and indigenous goats). Cases of three-day fever and oriental sore were also seen. Major Dr. Fashin Bey had already discovered the kala-azar parasite (positive puncture of the spleen), and the recurrent fever spirochæte in the blood. Since 1910 I examined the blood of Turkish soldiers in the military hospital suffering from malaria, and observed that all of them suffered from (tropical) malaria of the tertian type.

In March of this year (1912) I was again requested to continue the study from a double point of view—*viz.*, from the hygienic and from that of the tropical pathologist. The Commission proposed by me was composed of Dr. Scordo, my first assistant; Captain Dr. G. Rizzenti and myself. I also proposed a hygienist, an entomologist and a veterinarian, but without success.

We confirmed the existence of "relapsing fever," already studied from the bacteriological point of view by Captain Dr. Gallia, and my colleagues, Dr. Scordo and Dr. Rizzenti, have concluded a series of bacteriological researches on "typhus exanthemata," also from the point of view of serum-diagnosis. The reader will find the results of these researches in a paper shortly to be published. They have also studied an epidemic of infectious jaundice in the army, which broke out in Tripoli

and in Cyrenaica; the results from the bacteriological point of view were negative. I suppose the infectious agent penetrated into the organism by inoculation and that it belongs to the series of ultra-microscopical viruses. I observed two cases of " fièvre boutonneuse," treated for the first time in Tunis. I specially concentrated my attention on the Bedouins in the large camps of concentration, in the periphery of Tripoli, where I studied malaria, examining the blood and puncturing the spleen and ascertaining that there are almost constantly cases of tertian fever, though quartan fever is rare. I determined the index splenicus (54 per cent.) in children. After puncturing the spleen, in a large number of cases suspected to be kala-azar, I never succeeded in finding Leishman-Donovan parasites! While studying infectious diseases I directed my attention to tuberculosis, and ascertained that this disease is diffused among the Arabs, especially in the form of pulmonary tuberculosis!

It was, however, to the diseases of the skin, in collaboration with Dr. Labella, of the dermatological clinic of Professor Campana (Rome), that I directed my particular researches, because they are very frequent among the Arabs. We ascertained that the parasitical diseases (scabies, tinea, and tuberculosis) wound the skin by septic invasions, in the same manner as in Italy. We also found frambœsia or yaws, psoriasis tropica, ulcus tropicum, ulcus infantum, lichen tropicum, granuloma venereum, tinea alba, and tinea nigra circinata.

Clinical researches were directed towards ascertaining what tropical diseases of the digestive apparatus led to the constitution of the presence of tropical dysentery and of the diarrhœa of hot countries (sprue).

This first contribution to the study of the diseases of Libya confirms the following truths: That the Arabs on the coast show the same diseases as the inhabitants of the interior, and that, consequently, we must determine definitely the nosographism proper to the country and the race, before one can indicate the curative and prophylactic means necessary to defend the natives and the colonists.

We should naturally expect to find in Libya the tropical diseases mentioned above if we consider:—

(1) That the inhabitants of Libya are almost all Arabs; the Jews are found only in the towns along the coast.

(2) That the Arabs of the towns along the coast maintain a continual contact with the Arabs and the inhabitants of the interior provinces (Fezzan, Beriat, Bornu, Sudan, &c.), by means of caravans, which cause a continual change of people, animals, and goods.

(3) That the Bedouins, by reason of their perpetual mobility, are always conveying infectious germs to the oases as well as to the towns along the coast.

(4) That it was natural to find the same diseases in Libya that we have found in Egypt, in Tunis, and in Algiers, because the races are similar and the climate almost the same.

INTESTINAL PARASITES IN COSTA RICA.

A Report based on the Examination of 210 Patients in the Hospital of the United Fruit Company at Port Limon.

By Stanford Chaillé Jamison, M.D.
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(Studies from the Laboratories of Tropical Medicine and Hygiene under the direction of Creighton Wellman, Medical Department, Tulane University of Louisiana.—No. 27.)

In order to make clear the local conditions encountered during this study, it will be necessary to say a few words in regard to the population of Port Limon, the Atlantic port of Costa Rica, and the surrounding country. The largest part of the population is composed of negroes, imported from Jamaica, who have been in Costa Rica for from a few months to a lifetime; next to the negroes in number are the natives, who are rarely pure Spanish, the majority of them having a taint of negro blood; lastly, there is a small minority of Americans and English who have resided in the country for from a few months to many years.

The negroes and natives have all gone barefooted from early childhood, and nearly all recall having had ground-itch at one period or another. Cistern water is universal for drinking purposes, and, with the exception of that used at the hospital and hotel of the United Fruit Company, is never boiled or filtered. The soil of the country is loose and moist, and is ideal for the growth of those intestinal parasites which more or less mature in such a medium.

Of the 210 patients examined, only forty-two were negative. The majority of these negative stools were subject to not less than three careful examinations, and the centrifugal method was repeatedly used. A few of the patients, however, left the hospital before more than one examination could be made. It will be seen that of about 20 per cent. of the patients, fourteen had been in Costa Rica less than one year, nine between one and five years, four for life, and in twelve cases of Jamaica-born negroes the length of residence in Costa Rica could not be obtained, though it was probably less than five years. Eleven were Americans and English who had been in the country less than a year. Six were negroes from the island of St. Kitts, who had been in Costa Rica less than three years. Nineteen were negroes from Jamaica who had been in the country for from a few months to twenty-five years; the majority, however, for less than five years, and many for only a few months. Four were native-born Costa Ricans who had never been out of the country. The two remaining patients were foreigners who were examined once, and no data could be obtained concerning them.

One hundred and sixty-nine cases, or nearly 80 per cent., were positive for some intestinal parasite. Eighty-one of these positive cases were Jamaica negroes who had been in the country for from one month to many years. Twelve were negroes from St. Kitts, who had been in Costa Rica not more

than three years, and not less than eight months. Two were Englishmen, one an American, and one a Spaniard; all of whom had been in Costa Rica over two years. Fifty-six cases were natives of Costa Rica, or one of the neighbouring Republics.

PROTOZOA.

Family AMŒBIDÆ.

Genus *Entamœba*, Casagr. et Barb.

Entamœba histolytica, Schaud.—I saw but two cases of amœbiasis, both of which occurred in patients with bloody flux. Although I examined the stools of numerous patients with the clinical symptoms of dysentery, all were negative for amœba with the exception of the two cases; unfortunately, equipment for bacteriological examinations was lacking, but I believe that most of the cases of dysentery occurring in the region under discussion are of the bacillary type, and that amœbic dysentery is rare.

Family TETRAMITIDÆ, Bütsch.

Genus *Trichomonas*, Donné.

Trichomonas hominis, Dav.—This parasite was noticed in five cases.

VERMES.

Family ANGUILLULIDÆ.

Genus *Strongyloides*, Grassi.

Strongyloides intestinalis, Bavay.—Strongyloides occurred seven times. In two cases it was associated with other parasites; in four cases it was the only infection. Three of the cases had an intractable diarrhœa; the other three showed no symptoms.

Family TRICHINELLIDÆ.

Genus *Trichuris*, Bütt.

Trichuris trichiura, L.—The ova of *Trichuris* occurred in 141 of the patients examined; it occurred alone in eighty-one cases—that is, it is seen twice as often as any other ova; as a single infection, it is over four times as frequent as any other single infection.

The ova of *Trichuris* were seen as a single infection in three Spaniards, thirty-five Jamaica negroes, ten St. Kitt negroes, two Americans, twenty-seven native Costa Ricans, two Englishmen, one negro from the island of Barbados, and one Nicaraguan.

Family STRONGYLIDÆ.

Genus *Necator*, Stiles.

Necator americanus, Stiles.—The ova of *Necator americanus* were found in the stools of sixty-seven patients. They were found to be the only infection in twenty cases, and associated with other ova in forty-seven cases. Fourteen of the twenty cases were Jamaica negroes, the other six native-born Costa Ricans; both classes of patients always go barefooted. From the fact that most of the Jamaicans have been in Costa Rica for a short time, some of them only a few months, it is reasonable to believe that they brought the infection from their native island. As the Costa Ricans had never been away from the country, it is also apparent that hookworm disease is endemic in the Republic.

Hookworm ova occurred in a little over 30 per cent. of the stools examined—it occurred alone in 10 per cent.

Family ASCARIDÆ.

Genus *Ascaris*, L.

Ascaris lumbricoides, L.—Ascaris was noted nine times, but never as a single infection. It occurred twice in native Costa Ricans, and seven times in Jamaica negroes.

Genus *Oxyuris*, Rud.

Oxyuris vermicularis, L.—*Oxyuris* was seen in two cases; it occurred with other parasites, and the patients had been violently purged before the examination was made.

MIXED INFECTIONS.

There were fifty-nine cases of mixed infection. All the parasites mentioned above were found to occur in the same patient in one combination or another. The presence of one parasite in no way seemed to affect the presence of the other. *Necator* and *Trichuris* were present together thirty-two times; *Ascaris* and *Trichuris* four times; *Necator* and *Oxyuris* twice; *Necator*, *Ascaris*, and *Trichuris* nine times.

CONCLUSIONS.

It appears that *Trichuris* is by far the most extensive infection in this part of the world. When present the infection is enormous, and I believe that these large infections certainly give rise to symptoms by causing anæmia of a marked, though very seldom severe, grade. Hæmoglobin estimations were made in the majority of cases, but are not quoted, as the cases were all hospital cases, and were in hospital for supposedly other conditions; though I am convinced that the lassitude, headache, and vague intestinal symptoms so frequently complained of were often due to *Trichuris* infection of long standing and marked degree.

Necator and *Ascaris* are not as frequent as in many parts of the United States. Mixed infection seems to be more common in Central America than in our Southern States.

I found ordinary intestinal parasites in cases from Costa Rica, Columbia, Nicaragua, Jamaica, St. Kitts, Barbados, Cuba, and Porto Rico.

Of the few English and Americans examined, *Trichuris* was not found in those who had been in the Tropics less than a year, but was present in those examined who had been in Costa Rica for a longer period.

In conclusion, the writer would like to thank Dr. Robert E. Swigart, Medical Superintendent of the United Fruit Company, for the opportunity of making this study; Dr. Emilio Escheverria, Superintendent of the United Fruit Company's Hospital at Port Limon, for many courtesies during the stay in Costa Rica; and Professor Creighton Wellman, Head of the Tulane School of Tropical Medicine, at whose suggestion the examinations were carried out.

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ADULTERATIONS AND "IMPROVEMENTS" IN ARTICLES OF DIET.

THE recent discussion at the Royal Society of Arts in London on "The Adulteration of Jams" is calculated to cause a smile amongst those who have not given the subject a thought. Jam seems at first sight a trivial matter to be seriously dealt with, but those who listened to the excellent address by Mr. Ernest Marriage on the subject were impressed with the importance attaching to adulterations of this element of our diet. Nowhere, perhaps, is the subject of greater importance than in tropical countries, for British-made jams are met with in the most remote parts of our Empire. So universally have jams come to be an article of diet, both at home and abroad, that there is scarcely a household in which jam is not found on our table at one or more meals. Young and old, rich and poor alike, are dependent upon British manufacturers—or is it makers?—of jams for their supply of this article. In military campaigns, in scientific expeditions, be it to the Equator or the Poles, on sea or on shore, jams are welcomed and relished, and all expeditions are fitted out with a stock of these preserves. Why? Is it the mere sweetness that commends itself, or is it the fruit juices that dominate the desire? The ordinary consumer does not think of the reason why, but takes it because he likes it. Liking an article of food really means that the system craves for it, and it is interesting to know which of the two potent elements in jam are desired. The sugar in the preparation is in large quantity, and we know that in fatigue sugar has been proved to be physiologically superior to all other agents as a restorative; and it is not merely a speedy restorative, but a sustaining food, by which strength can be maintained for an appreciable time. There can be no doubt, therefore, that the desire for sweet foods is, from the amount of energy it occasions, a natural craving, especially after fatigue. The other physiological elements jams contribute to the dietary are the juices contained in the fruits from which they are made. That these fruit juices are as potent in the preserved state as they are in the fresh state is not believed, and there is everything in favour of the truth of the belief; but even fruit juices in the jams and fruit jellies which we use so largely must, and do, play an important part in the maintenance of health by warding off scorbutic tendencies and these are ever imminent in tropical as well as in Arctic regions, where dietary is often limited to well-nigh starvation point in the hope of getting rid of disease, especially varieties of intestinal flux.

Assuming, then, the usefulness of fruit made into jams and jellies, and seeing how universally they are used, it is surely the first care of the public health authorities that these articles of diet should be wholesome and that they should be as carefully inspected as are the milk and meat supplied to us.

The adulterations referred to in jam-making by expert inspectors are declared by them to be not such crude additions as pips of wood and the employment of turnips, carrots, or vegetables; these they leave to the public to detect by a pocket magnifying-glass. It is to be feared that the public do not usually examine the jams on their tables even with a magnifying-glass, which is not in the hands of the masses; but were it so the recognition of deleterious elements mentioned is not so easy a matter as to justify the consumer to take further steps in the matter, as the expenses of investigation and the doubtful issue of prosecutions are prohibitive to the poorer classes, upon whom these crude adulterations are for the most part practised. The expert investigators regard these adulterations as "antique fables," but tropical residents are not unacquainted with "fables" of the kind on their breakfast tables of to-day, as on the remote tropical residents these more readily detected adulterations are very largely palmed off.

The form of adulteration experts consider is a practice so general and so successful that it threatens to corrupt the whole jam trade, namely, the addition of the pulp, or the juice (which is the filtered pulp), of cheap fruit to dearer jams. The

mainstay of this adulteration is the apple, whilst lemons, gooseberries, and even red currants are used in some cases. Rhubarb, too, though not perhaps a fruit, plays a part in "mixed fruit" jams, and perhaps provides "fruit juices" in other preserves.

These practices are not, of course, advertised by the manufacturers as adulterations, but they are styled "improvements," "by the addition of fruit juices," or "by the addition of other choice fruit." The consumer cannot, however, see great harm in adding other fruits to, say, strawberry or raspberry jams. If gooseberries are wholesome fruit, why not add them to any kind of jam? Or if rhubarb is added, is it deleterious to the economy? Medically considered, however, it does matter what the improvements in our jams consist of. To give young children an ill-assorted composition containing turnips, vegetable marrow, &c., is not without danger to the digestion, and to give older people jam containing the crystals of such substances as tomatoes, rhubarb, &c., leads in many cases to kidney irritation attended by pain, due to the difficulty of passing these crystals through the kidney tubules.

Doctors are justified in asking that manufacturers not only of jams, but of various forms of preserved and prepared foods, should be compelled to put on their preparations labels stating exactly what is contained in their wares; for the doctor has to write his "preparations" in the form of a prescription which all may read and criticize, and it is surely even more essential that the composition of the food we eat should be known. It is unwholesome food that is largely responsible for the people becoming the doctor's patients; *his* "mixture" is but to remove the evils the unwholesome food has generated, but it is to the public interest that these evils should be prevented, and this can only be done when our food is wholesome, and when "adulterations" glossed over by the title "improvements" are rigidly dealt with and prevented.

Home-made jams and jellies are now at a discount in England. Few housewives nowadays take pride in matters of the kind; the cottager's wife will not even go to the trouble to pick the blackberries, which she can gather free of cost in the hedgerows, but instead gets them made for her into preserves by the manufacturers, and she says she can get them "just as good from the shops."

The Chairman (the writer) of the meeting, on referring to this subject, was held to be an "old fogy," as "out of date," and endowed with other qualities in which silliness and asinine propensities were prominent, by one of the "experts" present. Such is the opinion of at least one of our "authorities" in England to-day, and it seems a sorry prospect for our English home-life on which we were wont to pride ourselves should such opinions prevail amongst us.

J. C.

Annotations.

The Etiology of Pellagra.—Jennings and King, in the *Journal of the American Medical Association* (January 25, 1913), write on some possible factors in the causation of pellagra. They believe that if pellagra is caused by an infection, especially if of protozoal origin, and is transmitted by an insect, the present state of our knowledge may allow of the following deductions being drawn.

Under conditions existing in pellagra regions in South Carolina, the lice, fleas, mosquitoes and bedbugs show characteristics of habit, distribution and abundance which appear to exclude them from serious consideration in this connection.

The biting habits and, to a certain extent, the distribution of flies of the genus *Simulium*, together with their lack of habits which bring them into close association with man, seem to present weighty arguments against the incrimination of these gnats as the active agent in the transmission of pellagra.

On the other hand, the cosmopolitan biting stable-fly, *Stomoxys calcitrans*, from its distributional and biting habits, its close association with man, its conformation to the obvious requirements of the disease-transmitting insect and the agreement of its special characteristics with the phenomena incident to the occurrence of pellagra, is to be regarded with suspicion.

The authors hope that attention may be directed to this fly, and observations bearing on its possible relation to the disease be generally made.

They add that, should a causative organism be shown to exist which is a bacterium rather than a protozoon, and should this organism invade the body through either the mouth or the skin, the house or typhoid fly, *Musca domestica*, and the flies whose habits at all resemble it, would lie under strong suspicion. It is needless to say that the house-fly is excessively abundant and of universal distribution in the region studied.

The communication of pellagra in a purely mechanical manner by biting insects is a possibility, and, if shown to exist, would radically change ideas as to the insects which may be involved.

Finally, essential uniformity of causation must be assumed to exist universally, and the demonstrated failure of a supposed etiologic factor to account for the phenomena of pellagra in one locality must serve to exclude it from consideration as a factor in another.

The Treatment of Amœbic Dysentery.—In the *Indian Medical Gazette* for November, 1912, Leonard Rogers reports sixty cases of amœbic dysentery illustrating the treatment by ipecacuanha and emetine respectively. The following tables show his results at a glance.

As regards the administration of the emetine, Rogers states that the occasional failure of hypodermic injections, in the cases of very acute sloughing amœbic dysentery dying within less than three

TABLE I.—AMŒBIC DYSENTERY CASES TREATED WITH IPECACUANHA.

No.	Race	Sex	Age	Duration before admission	Type of fever	Maximum daily stools	Red corpuscles	White corpuscles	Ratio of white to red	Polynuclears per cent.	Days in hospital	Days on ipecacuanha	Grains ipecacuanha	Result
1	N.	M.	19	3 weeks	Rem.	15	4,750,000	8,750	1—541	72.0	1	2	...	Died.
2	H.	M.	35	8 days	Int.	29	6,180,000	11,000	1—562	86.4	2	2	80	,,
3	M.	M.	30	1 month	*Nil*	20	3,200,000	30,250	1—106	75.6	2	...	...	,,
4	M.	M.	15	2 months	,,	15	2,940,000	35,750	1— 82	76.0	1	...	...	,,
5	H.	M.	32	7 days	Rem.	18	6,010,000	13,000	1—461	71.6	8	2	120	,,
6	M.	M.	30	8 ,,	Int.	25	4,690,000	31,000	1—151	78.8	7	7	260	,,
7	M.	M.	40	20 ,,	Rem.	20	5,290,000	26,000	1—203	81.6	4	3	90	,,
8	H.	M.	30	15 ,,	*Nil*	25	3,650,000	4,250	1— 859	...	8	8	410	,,
9	H.	M.	21	8 months	,,	12	2,300,000	14,000	1—164	...	8	7	250	,,
10	M.	M.	45	3 ,,	Int.	12	4,450,000	8,000	1—556	72.4	12	8	160	,,
11	N.	M.	...	Chronic	*Nil*	31	4,340,000	11,750	1—347	82.4	10	6	180	,,
12	H.	M.	32	18 days	,,	15	5,500,000	32,500	1—164	81.6	4	3	90	Otherwise better.
13	M.	M.	25	6 ,,	,,	11	3,220,000	8,500	1—379	58.4	20	20	1,000	,, no better.
14	C.	M.	29	10 ,,	Int.	27	3,960,000	25,000	1—118	79.6	10	10	350	,, very bad.
15	E.	M.	29	2 months	,,	11	4,700,000	35,750	1—124	...	3	1	30	,, no better.
16	H.	M.	30	7 ,,	*Nil*	7	4,870,000	33,750	1—144	87.6	1	1	30	,, no better.
17	H.	M.	38	2 ,,	,,	7	4,090,000	12,500	1—327	...	4	3	180	,, very bad.
18	M.	M.	35	10 days	,,	25	5,580,000	37,250	1—150	85.0	10	9	420	Cured.
19	M.	M.	40	11 ,,	,,	11	5,730,000	13,250	1—433	82.4	14	12	480	,,
20	M.	M.	36	15 ,,	Int.	7	5,800,000	7,500	1—507	...	10	6	360	,,
21	M.	M.	40	14 ,,	*Nil*	9	4,230,000	11,750	1—360	...	9	5	300	,,
22	E.	F.	40	9 ,,	,,	7	4,270,000	12,000	1—356	...	8	5	180	,,
23	M.	M.	55	1 month	Int.	29	3,440,000	15,500	1—222	...	26	15	460	,,
24	M.	M.	20	1 ,,	...	17	3,840,000	9,750	1—394	74.4	16	13	360	,,
25	H.	M.	21	Chronic	Int.	20	2,730,000	7,250	1—376	72.8	19	8	270	,,
26	M.	M.	29	5 months	,,	16	3,860,000	21,500	1—181	74.4	7	7	220	,,
27	N.	M.	32	1½ ,,	,,	22	3,280,000	10,000	1—328	...	18	10	400	,,
28	H.	M.	25	1½ years	,,	13	2,610,000	12,500	1—209	53.6	60	44	1,320	,,
29	H.	M.	15	1 year	...	9	4,330,000	13,000	1—333	44.8	7	7	140	,,
30	H.	M.	36	3 months	*Nil*	5	3,280,000	14,750	1—239	81.6	9	7	370	,,

TABLE II.—AMŒBIC DYSENTERY CASES TREATED WITH EMETINE SALTS HYPODERMICALLY.

No	Race	Se	Age	Duration before admission	Type of fever	Maximum daily stools	Red corpuscles	White corpuscles	Ratio of white to red	Polynuclears per cent.	Days in hospital	Days emetine to cure	Grains emetine to cure	Further emetine	Result
1	H.	M.	45	12 days	Int.	26	5,960,000	22,250	1—268	88.4	2	2	3½	...	Died gangrene.
2	H.	F.	45	1 day	,,	12	5,660,000	61,750	1— 92	84.8	1	1	1	...	,,
3	E.	F.	30	7 months	Rem.	14	...	...	...	...	6	2	1	2	,, heat-stroke.
4	H.	M.	30	2 ,,	Int.	10	3,190,000	8,000	1—399	52.0	17	4	2	2	,, cancrumoris.
5	N.	F.	40	5 days	,,	12	5,340,000	14,000	1—381	82.0	9	2	1	½	Cured.
6	M.	F.	38	1 day	*Nil*	6	5,320,000	14,000	1—380	...	6	3	1½	...	,,
7	H.	M.	15	15 days	Int.	17	3,340,000	10,500	1—318	70.4	7	3	3	1⅓	,,
8	M.	M.	38	14 ,,	,,	11	5,560,000	28,000	1—198	66.0	6	4	2⅓	...	,,
9	H.	F.	20	6 ,,	,,	24	1,930,000	2,750	1—722	...	8	4	1⅔	⅔	,,
10	H.	M.	52	20 ,,	*Nil*	11	5,240,000	12,250	1—428	85.2	8	4	4	...	,,
11	M.	M.	17	10 ,,	,,	6	3 890,000	10,250	1—380	78.4	3	1	1	⅔	,,
12	J.	F.	29	3 ,,	,,	7	...	...	...	...	7	1	1	...	,,
13	H.	M.	24	1 day	Rem.	24	5,560,000	32,500	1—171	89.8	8	1	1½	1	,,
14	H.	M.	32	15 days	*Nil*	13	5,550,000	13,750	1—404	79.6	11	3	2⅓	⅓	,,
15	H.	M.	30	5 ,,	Int.	6	2,490,000	5,500	1—483	76.0	5	3	1⅓	...	,,
16	N.	M.	30	1½ months	,,	9	6,270,000	30,500	1—206	90.8	11	2	2	1	,,
17	E.	M.	25	6 ,,	*Nil*	4	4,930,000	12,000	1—411	...	6	2	1	1½	,,
18	H.	F.	52	1 month	,,	13	3,600,000	26,250	1—137	88.8	7	2	2⅔	2	,,
19	H.	M.	32	3 months	,,	16	5,140,000	12,250	1—348	86.8	7	3	1⅔	⅔	,,
20	H.	M.	20	4 ,,	,,	14	5,670,000	21,250	1—261	68.8	7	2	2	⅔	,,
21	H.	M.	32	1 year	,,	19	4,030,000	13,750	1—366	90.0	8	3	3	...	,,
22	M.	M.	20	6 months	,,	6	5,210,000	13,500	1—385	56.6	7	1	1	1	,,
23	H.	M.	24	2 ,,	,,	8	4,010,000	7,500	1—535	73.2	5	1	1	1⅓	,,
24	H.	M.	22	4 years	,,	7	3,460,000	11,000	1—314	67.6	7	2	2	⅔	,,
25	H.	M.	36	1½ months	,,	6	3,040,000	9,500	1—320	72.4	9	1	1	1⅓	,,
26	M.	F.	34	1½ ,,	,,	11	3,550,000	8,250	1—430	80.4	6	3	2⅔	...	,,

Races.—M. = Mahomedan. H. = Hindu. E. = European. N. = Native. J. = Japanese. C. = Chinese.

days of admission, has led him to consider the possibility of giving the salt intravenously. In a recent very severe case with great thickening of the cæcum and local peritonitis, he gave a dose of half a grain of the hydrochloride of emetine dissolved in 5 c.c. of normal saline. This was injected very slowly into an arm vein, the pulse being carefully watched. No depression followed. In the evening two-thirds of a grain were given in the same way, and on the following day a full grain, in addition to subcutaneous injections. At the time of writing the local symptoms have much improved, the passage of sloughs has ceased, while the amœbæ have disappeared from the stools within twenty-four hours of the first injection, and there is a fair hope of recovery. Whatever the ultimate result may be, it is at least clear that very full doses of the drug may safely be injected intravenously, which is clearly the best plan in desperate cases. There was no sickness or nausea after the last two large intravenous doses, but bilious vomiting both before and after the first one, so Rogers believes that the vomiting after ipecacuanha by the mouth is due to a local action on the stomach.

Myiasis.—Carter and Blacklock, writing from the Runcorn Research Laboratories, report a case of external myiasis in a monkey, in the *British Medical Journal*, January 11, 1913. The larvæ were noted on a *Cercopithecus callitrichus*. The monkey was suffering from acute tuberculosis, and died the day following the observance and removal of the parasites. One batch of these larvæ were taken from the nose and region of the face surrounding the mouth, the other from the right side of the body near the groin. In both cases the larvæ were in various stages of development, some of them having apparently only recently hatched. Altogether twenty-one of these parasites were removed from the host, and were subsequently placed in Petri dishes containing raw flesh and sand.

It became evident that at least two species of diptera were inculpated, sixteen specimens being of the typical *Muscid* type and the remainder larvæ of *Fannia canicularis*. Two examples of the latter were allowed to complete their development, the adults emerging on July 27 and August 5. The majority of the remaining larvæ pupated by June 29, but four specimens remained in the larval stage until July 5, 6, and 7 respectively. The four specimens referred to were separated, and subsequently on July 16, 18, and 19 three specimens of the blow-fly, *Calliphora erythrocephala*, emerged, the remaining example having shrivelled up. From the remaining puparia seven specimens of *Muscina stabulans* were obtained, the period spent in this stage varying from eleven to nineteen days.

The above records are of some interest, as neither *Fannia canicularis* nor *Muscina stabulans* can be classed among the "flesh flies," although both, but more especially the former, have been known to occur in the alimentary tract of human beings. The natural breeding places of the so-called lesser housefly (*Fannia*) are human excrement and decaying vegetable matter, but records are in existence of its having been reared from the larvæ of a lepidopterous insect (*Epischnia cancella*) and of its occurrence in the nest of the common bumble-bee (*Bombus*). It is possible, therefore, that the larvæ in question may have been derived from an external source, as, for example, the food of the monkey at the bottom of the cage; but, however this may be, they were found by us on the animal itself. In this connection also it is worth noticing that the monkey was taken a considerable distance from the cage before the larvæ were removed. The larvæ of *Muscina stabulans* also feed on decaying vegetable substances and dung; they sometimes, however, attack growing plants, but in these cases have probably been introduced with the manure. The fly has also been reared from human excrement and from the pupæ of certain insects, notably those of the gipsy moth, although there appears to be some doubt whether the pupæ attacked were healthy or not.

Syphilis simulating Liver Abscess.—A case of tertiary syphilis closely resembling a hepatic abscess is reported in the *Journal of the Royal Army Medical Corps*, No. 1, January 1913, vol. xx, p. 88. The patient was admitted to the medical ward of the Military Hospital, Mauritius, on August 7, 1912, which appeared to be the fifth day of his disease. On admission his temperature was 104° F., and he complained of headache and of pain in the hepatic region; the onset had been gradual and there was no history of preceding diarrhœal disease. His liver was enlarged upwards to the extent of two interspaces, the lower margin of the organ being in its normal position. This enlargement appeared to be confined to the right lobe, and, as far as could be ascertained, was uniform. No other abnormalities could be discovered on clinical examination. Urine and blood cultures proved negative, as did the examination of blood films. There was no leucocytosis, and the urine was normal except for the presence of considerable amounts of urinary indigogens.

The temperature was irregular, but usually ranged between 102° and 103° F. in the evening, and after the first few days there were marked morning remissions, the temperature touching normal on several occasions.

A diagnosis of "inflammation of the liver" was made, and ipecac. 30 gr. was administered twice daily. During the patient's first week in hospital his liver symptoms became more marked, and a slight icteroid tinge appeared. At this stage diarrhœa occurred, the bowels being moved about five times a day. No amœbæ were ever seen.

The red cells steadily decreased in number to 3,900,000 (the hospital is 2,000 ft. above sea-level), and the hæmoglobin fell to 50 per cent.; the average white count was 6,900.

The commencement of profuse night-sweats, the more hectic type of temperature, and the patient's

wasting led to the presence of pus being suspected, and on September 10 aspiration of the liver was performed under general anæsthesia. While on the operating table a distinct bulging of the thoracic wall over the liver was clearly discernible for the first time. The right lobe was aspirated at three different levels, and from each of these points the needle was inserted into the liver first directly inwards, then upwards, downwards, forwards, and backwards, so that very little of the right lobe can have been unexplored. No pus was discovered, but, nevertheless, some benefit from the aspiration was expected. However, this hope was disappointed, for the liver remained unaltered in size, and his general condition unimproved; indeed, two days subsequent to the operation he appeared considerably worse.

The possibility of tertiary syphilis was then considered, but no specific history could be obtained although the patient acknowledged frequent exposure to infection. However, he was put on antisyphilitic treatment, and with most striking results. There was an almost immediate improvement in his condition, the temperature steadily fell, and in three days reached normal. In another three days the hepatic enlargement had disappeared; the red blood count and colour index rose rapidly, and the patient made a quick and uninterrupted recovery. In the meantime a Wassermann's test had been carried out, and the occurrence of a positive reaction resulted in the hypothetical diagnosis becoming a certainty.

The Health of the Canal Zone.—Colonel Gorgas, in his monthly report of the Department of Sanitation of the Isthmian Canal Commission for the month of December, 1912, states that the total number of deaths from all causes among employees was 32, divided as follows: Disease 23, and violence 9, giving the annual average per thousand of 5.13 and 2.01 respectively.

Among employees for the month of December of each year the annual average death-rate per thousand was as follows:—

1904, 19.44; 1905, 45.73; 1906, 30.27; 1907, 18.11; 1908, 25.03; 1909, 13.84; 1910, 10.91; 1911, 10.42; 1912, 7.14.

The annual average death-rate per thousand in the cities of Panama and Colon, and the Canal Zone, including both employees and civil population for the month of December of each year, was as follows:—

1904, 44.75; 1905, 58.78; 1906, 39.21; 1907, 28.50; 1908, 26.15; 1909, 21.50; 1910, 25.16; 1911, 20.30; 1912, 20.99.

In segregating, according to race, the annual average death-rate per thousand from disease among employees was: For whites 3.74, and for blacks 5.56, giving a general average for disease of 5.13. For the same month during 1910 the annual average death-rate per thousand from disease among whites was 5.59, and blacks 8.79, giving a general average of 7.94; and in 1911 from disease among whites 5.71, and blacks 5.68, giving a general average of 5.68.

Among employees during the month, deaths from the principal diseases were as follows: Lobar pneumonia, 6; malarial fever, 1; organic disease of heart, 1; tuberculosis, 6; leaving 9 deaths from all other diseases, and 9 deaths from external violence.

No cases of yellow fever, small-pox, or plague originated on or were brought to the Isthmus during the month.

Sleeping Sickness in Nyasaland.—Hearsey, continuing his "Diary on Sleeping Sickness in Nyasaland" (part xviii), states that since the issue of the last number of this series, part xvii, seventeen additional cases of sleeping sickness have been diagnosed by Dr. Shircore, and these added to the seventy-six previously recorded now make a total of ninety-three cases.

Dr. Shircore furnishes the following notes on a case who came up to the Ngani Camp for observation and treatment. The patient was first taken ill on or about May 8, 1912, and died on August 13, the duration of the illness from its onset to a fatal termination being a period of approximately ninety-seven days.

Chituluka, of Mkokawambo village, a male aged about 32. The patient has been ill since about May 8, and was first seen and examined on June 14. He complains of having first suffered from headache, which was later followed by pain in the chest. The patient is thin, and has a tired, dull expression. There is no puffiness of the face, and his mental condition is good. No tremors of hands, and no œdema of feet; he can walk well and without assistance. The glands in the right posterior triangle are just palpable; supraclaviculars are not enlarged; but the left epitrochlea is about the size of an almond, the right being somewhat smaller. Pulse 90, regular in force and frequency, pressure moderate; respirations 20; temperature 99.6° F. In fresh preparations and with ⅛ in. objective, trypanosomes five in 100 fields.

The patient consented to go to the segregation camp at Ngani, and walked up in three days, a distance of about thirty miles. The route chosen was practically fly-free, and two men accompanied him to guard against any stray ones. He was admitted into hospital on June 19.

On admission he complained of a slight cough, but otherwise had no subjective symptoms. On the 29th he passed some loose motions, and on the following day a slight puffiness of the face was noticeable.

Some slight difficulty in walking was experienced on July 5, accompanied with pain in the legs and knees. On the 6th, glands in the right axilla enlarged, and on the following day pain in the chest was complained of. The patient, from the 11th onwards, began to get progressively weaker, with deterioration of his mental condition, and somnolence. From the 12th to the 19th there was a gradually developing asthenia. On the 20th the dye, "B.S.," in 4 gr. doses, once a day, was

administered. Two hours after the administration of the first dose the temperature had risen from 96° F. to 99.8° F.; pulse from 76 to 108; and respirations from 28 to 32. A blood count made the day before the dye was given showed: R.B.C. 3,700,000; W.B.C., 11,800; H.B., 35 per cent.; C.I., $\frac{35}{74}$.

A differential leucocyte count of 508 cells gave: Polymorphonuclears, 50.59 per cent.; lymphocytes, 40.35 per cent.; hyaline cells, 9.05 per cent.; eosinophiles, not observed.

From the 20th the patient objected to blood films being made, and seemed obsessed with the recollection of the fact that blood had been taken from his arm and injected into a dog, which was sent to the Commission.

The dye was administered daily up to the 27th, diarrhœa then supervened, both urine and fæces being stained red, and the patient began to pass his motions in bed. On the 28th he was very weak, but still intelligent, stating he thought that the diarrhœa was due to the dye, and desired that it should be discontinued. He passed a motion during the night and vomited the following day. 29th—complained of pain in abdomen; he is now very weak and much emaciated. Up to the present the evening temperature has always been above 98.4° F. 30th—temperature does not show an evening rise and is below 96° F. 31st—temperature subnormal, pulse and respiration failing, dye suspended. In the evening liq. strych. 3 min., and brandy ½oz. were given; patient's condition grave.

August 1 to 13, no difference in condition, is somnolent. 4th—disinclined to take nourishment. 5th to 8th—temperature about 95° F. both morning and evening, pulse and respiration rates diminishing, radial pulse hardly perceptible. 9th and 10th—pulse 48. 11th—brachial pulse 40; the patient is semi-comatose and unable to take any nourishment. 12th—condition about the same. 13th—comatose; brachial pulse 40; respirations 14; died at 9 p.m.

The case has shown a regular intermittent type of temperature and low average pulse and respiration rates. The dye "B.S." has had no beneficial effect; on the contrary it has produced diarrhœa which undermined the patient's strength. On the 20th, 21st and 22nd, with doses of 4 gr. per diem, diarrhœa occurred; the dose was then reduced for the next three days and diarrhœa ceased. Resumption of the dye in larger doses again produced diarrhœa and pain in the abdomen up till the 30th, when this treatment had to be discontinued. From the 31st onwards, till the fatal termination of the case, there was no diarrhœa, nor did the patient pass his motions in bed as he had done previously.

The dye "B.S." mentioned above (Brieger and Krause) was received for trial and submitted to Dr. Shircore, who reports as follows: The dye has been administered to three patients in doses of from 10 to 15 gr. per diem, for periods varying from nine to twelve days. In these doses it is most difficult to dissolve unless a large quantity of water is used. The dye stains the mucous membranes of the mouth for days, and probably all such membranes as come into contact with it. It is excreted in the urine and fæces. The dye has a bitter taste which at first does not seem to trouble the patients, but after a few days a growing dislike is acquired. The first dose caused slight delirium in one of the patients, who later suffered from diarrhœa and vomiting due to the same cause. In the case just described the dye had not the slightest beneficial effect, its trypanocidal action being *nil*, and the patient's condition became so bad towards the end of the trial that it had to be discontinued. Another case at Ngani Camp was also given the dye. He too took a strong dislike to it after a few days, and his condition became rapidly worse, so it was impossible to persevere further with it. The third case the dye was given to behaved much in the same manner; she was a great deal more patient than the two men mentioned above, though complaining that none of her symptoms, such as pains in the chest and legs, were relieved by it. This woman died a few days after the treatment was suspended. Dr. Shircore is of opinion that the dye is of no value as a therapeutic agent, and he considers, moreover, that it is harmful. A few days after its use asthenia and emaciation supervene, and the drug appears to interfere with the digestion and assimilation of food, causing diarrhœa, loss of weight and progressive asthenia. In one of the cases quinine was later given together with the dye, and on other occasions atoxyl also, by mouth, with certainly no appreciable benefit.

Trypanosomes were always present when blood examinations were made, and Dr. Shircore states he is unable to mention a single point in favour of this dye, and cannot therefore recommend its use.

The Etiology of Beriberi.—The *Philippine Journal of Science* (vol. vii, sec. B, No. 4, August, 1912) is given up to papers on the etiology of beriberi, the first by Strong and Crowell, the second by Vedder.

I.—Strong and Crowell in their conclusions state that it is evident that among the individuals comprising their experiments beriberi was produced only by means of the diet, and that the disease has, therefore, a true dietetic causation. It is further evident from their experiments that beriberi develops owing to the absence of some substance or substances in the diet necessary for the normal physiological processes of the body. Without the supply of such substances in the food, beriberi results. Such a substance or such substances are evidently present in red rice and in rice polishings, and also in small amount in the alcoholic extract of rice polishings, and when these articles are added to what would appear to be an otherwise physiologically proper diet, they usually prevent the development of the symptoms of the disease. In some instances, however, even when these substances are constituents of the diet, when the diet is without variation and composed of very few articles, and the individual suffers from loss of appetite and the assimilative functions appear to be poor and he loses markedly in weight, symptoms of

beriberi may develop in such individuals. However, such symptoms may be dispersed by causing a variation in the diet by the addition of other nutritious substances to it. It is also evident from their experiments that the disease is certainly not an infectious one in the sense in which that term is usually employed. The rigid isolation of the prisoners undergoing the test would seem to exclude the possibility of the introduction of an infectious agent through any other individual or by the introduction of any article. It is also noteworthy that the cases of beriberi developed under the most favourable hygienic conditions with exception in regard to diet. It is not probable that the infection could have been introduced with the food, since this was all freshly cooked, and at a temperature at which only a spore-bearing organism would survive. The food was also eaten a very short time after being cooked. Moreover, if the infection had been introduced with the food, the incidence of the disease should have been the same in all of the groups, which it was not. No fermentation of the rice employed occurred either before or after it was cooked, so that it would appear that the action of such bacteria as have been described by Kohlbrügge and by Bréaudat could be excluded. It has been suggested that a diet of white rice predisposes to the disease, since it furnishes a better medium for the development of the specific organism which resides in the intestine of the host, and that the red rice or extract of polishings forms a preventive for the development of such a specific organism. There is no definite evidence of such a hypothesis and, moreover, the results obtained would argue against it, since in two instances at least distinct symptoms of beriberi were present in individuals who had received these substances in the diet. It cannot be claimed with reason that the resistance of the individuals having been lowered by weakness and loss of weight, the specific organism residing in the intestine of the individual was able to increase and multiply and produce the disease; for in several instances where the loss of weight of the individuals was marked and their general condition poor no symptoms of beriberi developed. The evidence is definite that beriberi in the Philippine Islands is due to the prolonged consumption of a diet which lacks certain substances necessary for the normal physiological needs of the human body. That the disease encountered was true beriberi was confirmed definitely by the lesions encountered in the pathological study. As to the definite chemical nature of the substance or substances in the food which prevents the development of beriberi further investigations are necessary. For the prevention and cure of the disease in man all that is necessary is that he shall be supplied with a liberal and nutritious diet suitable to the physiological needs of the body. The recent researches of Schaumann, of Chamberlain, Vedder, and Williams, of Funk, of Axelholst, and of Simpson have thrown much light upon the question of the nature of the protective substance in the diet. Nevertheless, opinions are not yet in accord in regard to its exact chemical nature.

Fraser and Stanton have repeatedly called attention to the fact that the phosphorus content of the rice serves as an indication of the extent to which the rice has been polished, and have suggested that any rice which contains 0.4 per cent. or more of phosphorus pentoxide might be regarded as safe for a staple article of diet in preventing polyneuritis gallinarum in fowls and, hence, beriberi in man. They state, " None of the rices connected with outbreaks of beriberi yielded more than 0.26 per cent. of phosphorus pentoxide. The rices substituted for these, and which were effective in preventing the continuance of the outbreaks, yielded not less than 0.4 per cent. of that substance." More recently Heiser advocates for the prevention of beriberi the passage of a law placing a tax upon rice which contains less than 0.4 per cent. of phosphorus pentoxide, such rice being regarded legally as polished rice, and no tax on rice which contains 0.4 per cent. or more of phosphorus pentoxide, such rice being regarded legally as an unpolished rice. Although it seems quite definite that a rice containing this amount of phosphorus will prevent the appearance of polyneuritis in fowls, nevertheless, from our experiments it is evident that beriberi in man may be produced by rice containing 0.37 per cent. of phosphorus pentoxide when it forms the staple article of a little varied diet. Therefore the question arises as to whether the margin of safety is sufficient between such a rice and that containing only 0.4 per cent. of this substance. Since it has been generally admitted that the higher the phosphorus content of rice the less is the liability of that rice to produce beriberi, and since Fraser and Stanton found as an average result of all their examinations that unpolished rice contained 0.54 per cent. of phosphorus pentoxide, and Aron found that unpolished rice in the Philippine Islands contains 0.557 per cent. of phosphorus pentoxide and freshly husked rice 0.455 per cent., before legislation is enacted it would seem to be advisable to consider carefully the question of the amount of phosphorus pentoxide which a rice should legally be required to contain in order for it to be regarded as an unpolished rice and to be exempt from taxation in the Philippine Islands.

II.—Vedder's conclusions are as follows:—

(1) The administration of large amounts of alcohol has failed to produce neuritis in fowls.

(2) Fowls develop polyneuritis when fed on a diet containing a sufficiency of all the alimentary principles, providing no one of the ingredients of this diet contains the neuritis-preventing substance.

(3) The neuritis-preventing substance is not volatile, but is destroyed by heat.

(4) The neuritis-preventing substance is not an inorganic salt.

(5) The neuritis-preventing substance is probably not an alkaloid.

(6) Since it has been shown that this substance is not a fat, proteid, inorganic salt, or alkaloid, it seems probable that it is an organic base as claimed by Funk, but Vedder has not been able to confirm this yet.

Abstract.

STUDIES ON PNEUMONIC PLAGUE—THE PNEUMONIC STRAIN OF "BACILLUS PESTIS."

RICHARD P. STRONG and OSCAR TEAGUE, who studied pneumonic plague in Manchuria during the winter of 1910-1911, state* that during the epidemic the idea became rather general that the organism of pneumonic plague differed, in some respects at least, from *Bacillus pestis* of bubonic plague. Apart from cultural variations, some physicians believed that while the bacillus of bubonic plague on inoculation into guinea-pigs gave rise to buboes, the bacillus of this epidemic, on injection into these animals, caused only pneumonia and septicæmia. Also, it was claimed by some, that the virulence of the organism of pneumonic plague was much greater than that of the bacillus of bubonic plague. These ideas were erroneous, as is apparent from a consideration in detail of the properties of the pneumonic strain arrived at from the study of numerous microscopical preparations and cultures obtained from the sputum and from necropsies performed during the epidemic.

Morphology.—The causative organism of the Manchurian epidemic of pneumonic plague apparently differs in no respect from other strains of *B. pestis* isolated during many epidemics of bubonic plague. In stained microscopic preparations made from the organs at necropsy it appears in its most characteristic form as a short bacillus, more or less ovoid in form, swollen in the centre, and rounded at the ends. It exhibits marked bipolar staining, the central portion either remaining uncoloured or staining lightly. Such preparations and those made from sputum often show, besides these bipolar forms, great variation in the morphology of the organisms present. Involution forms, consisting of longer, thicker, deeply staining rods, or of organisms which have assumed a spherical or orbicular outline, or, occasionally even appearing very much as yeast cells, may be encountered. Many of these forms stain poorly, or sometimes only a portion of the organism is stained, and in the shorter bacilli the appearance of ring forms is thus produced. In agar cultures, and particularly in 3 per cent. salt agar, these large involution forms and degenerating organisms of very different shapes are very numerous and characteristic; long and slender or thick bacilli and also boat-shaped, dumb-bell, ring-shaped, and spherical organisms may all be observed. The organism generally appears in preparations from agar cultures as a short or longer rod, and does not so frequently reveal the marked bipolar appearance when stained. In hanging-drop preparations no true motility is exhibited. No flagella are visible in properly stained preparations, and no spores have been demonstrated. It stains easily with all the aniline dyes, and particularly well with dilute carbol-fuchsin solution, and is easily and completely decolorized by Gram's stain.

Cultural Characteristics are practically identical with those of many bubonic strains. Some of the freshly-isolated pneumonic cultures caused no turbidity when grown in bouillon, the growth rapidly falling to the bottom of the media and leaving the supernatant fluid clear. However, this is not invariably the case, as other pneumonic cultures cause slight turbidity. These variations in the different cultures evidently depended more upon the amount and manner of inoculation of the organisms and the character of the media than upon any particular characteristic of the culture itself.

In Manila, the authors have studied three different bubonic cultures recently isolated—one from Shanghai, one from Hong Kong, and one from Mariveles, Philippine Islands—and three cultures from different pneumonic cases. These were each inoculated in tubes of bouillon and grown side by side at room temperature. No difference in growth as to the cloudiness of the bouillon, amount of sediment, &c., could be observed in the different tubes. In one of the pneumonic cultures and in one of the bubonic ones the growth and flocculi seemed somewhat heavier than in the other tubes. The growth in all of the cultures became visible, about the second day, in the form of fine flocculent masses which later greatly increased in size and became deposited partly along the sides and at the bottom of the tubes. The bouillon in all was slightly clouded. Microscopical specimens from the different cultures revealed chains of coccoid bacilli.

Mucus Production.—The production of mucus by the pneumonic strain when grown upon agar slants has been marked, but varies greatly, as is also the case with bubonic strains, according to the temperature at which the cultures develop.

Another factor, which in their experience had exerted an important influence upon the mucus production of a plague strain, is the length of time it has been cultivated upon artificial media. Freshly isolated strains, whether from human subjects or from experimental animals, produce more mucus than strains which have been cultivated on agar for some time.

The age of the culture is a factor influencing the amount of mucus present. A twenty-four hour culture will contain less mucus than the same culture several days later.

They had not observed with regard to mucus production that their pneumonic plague strains in any way differed from the bubonic strains.

Virulence.—The organism seems to have retained a maximum virulence throughout the epidemic; at least all of the cultures isolated and studied by inoculation into animals possessed this very high degree of virulence. Cultures isolated near the close of the epidemic showed an equally high virulence to those isolated near its beginning. However, the idea that this epidemic of pneumonic plague was due to the fact that the strain possessed an abnormally high virulence—much greater than that possessed by the organism of bubonic plague—

* *Philippine Journal of Science*, Section B, vol. vii, No. 3, June, 1912.

and that this accounted for the very high mortality during the epidemic appears to be erroneous. The very acute course of the disease, the very high death-rate during the epidemic as compared with that of bubonic plague, and the apparently increased virulence of this pneumonic strain may be satisfactorily explained by the fact that the portal of entry of the organism and the location of the primary points of infection in pneumonic plague and in bubonic plague are different. The plague organism finds in the pulmonary tissues a much more favourable and extensive medium for its multiplication and diffusion than it does in the lymphatic glands. In bubonic plague, the lymphatic glands may be said to act as filters against the general invasion of the organism by the plague bacillus, while in primary pneumonic plague there is no such mechanism for the defence of the host, the bacilli spreading rapidly throughout the lung and invading the circulation in every instance in a comparatively short time and apparently before the organism has had time to produce any appreciable quantity of immune substances. The bronchial lymphatic glands in primary pneumonic plague offer resistance to the invasion of the plague bacillus, and in every case of this disease these glands are very acutely inflamed and frequently almost of a black colour from the resulting toxic hæmorrhages in the glandular substance. However, by the time the bronchial glands have become involved, the bacteria have already spread so extensively throughout the lung substance that a bacteræmia has usually occurred. Microscopical preparations made at necropsy from the lungs of these pneumonic cases invariably contain enormous numbers of plague bacilli. In no other disease are the organisms found in such great abundance. In primary pneumonic plague, the bacilli are found in very much greater number in the lung than in the spleen, even though an advanced bacteræmia is present. This fact, also, suggests that the lung tissue offers a more favourable location for the growth and multiplication of the bacilli than does the spleen. The bacteria are also present in far greater numbers in the lung than they are ever found in the buboes or spleen in bubonic plague cases. It is also evident that in pneumonic plague the infected lung (which may be said to correspond to the primary bubo of bubonic plague) contains, by reason of the size of the infected area, a far greater number of plague bacilli than the primary bubo in bubonic plague. During epidemics of bubonic plague, there are occasionally small epidemics of pneumonic plague in which the same high mortality and acute course of the disease is observed as occurred in the Manchurian epidemic of pneumonic plague. This is another argument in favour of the fact that during epidemics of bubonic plague the causative organism may show the same high virulence. As examples may be cited the epidemic of bubonic plague in Japan—in Kobe and in Osaka in 1899 to 1900—in which thirteen cases of primary pest pneumonia all terminated fatally after a very rapid course, and the epidemic of bubonic plague in 1898 in Bombay, in which, toward its close, eleven cases of pneumonic plague also all quickly succumbed one after the other.

All this evidence is in favour of the supposition that the organism giving rise to the Manchurian epidemic is of no greater virulence than in the case of many bubonic strains; furthermore, definite proof of this fact has been obtained from comparative inoculations made in animals with different pneumonic and bubonic cultures.

These experiments have shown that the pneumonic cultures have not possessed any greater virulence than that possessed by many virulent bubonic ones of the organism. Mice, rats, guinea-pigs, and monkeys inoculated with virulent bubonic cultures die within the same period of time and from the same doses as do the corresponding animals inoculated with the pneumonic cultures. The same lesions are observed in animals after inoculation of the pneumonic strain as after the inoculation of the bubonic strain. Both strains when inoculated cutaneously, or subcutaneously, into guinea-pigs and monkeys give rise to bubonic plague infection. When the animals are infected by inhalation with either strain, similar lesions are also produced. In guinea-pigs, after inhalation, infection results through the mucous membrane of the throat and upper portion of the respiratory tract, resulting in buboes of the cervical glands and septicæmia and in primary or secondary pneumonia; in monkeys, after infection by inhalation, primary pneumonic infection of the lung with secondary septicæmia results.

However, while during epidemics of bubonic plague reports have been made that there is often a marked difference in virulence in the different cultures isolated, during this epidemic of pneumonic plague the organism seems to have retained a very high degree of virulence throughout. The cultures isolated from a number of cases near the close of the epidemic, upon inoculation into animals, proved to be fully as virulent and to kill animals as quickly and in the same doses as did those cultures isolated near the beginning. That the organism retained such a stable virulence throughout the epidemic is, perhaps, not surprising when one considers that infection occurred directly from man to man, or, frequently one might say, from lung to lung and without the passage of the organism through rodents, as ordinarily occurs in bubonic plague infection. Moreover, from the results of previous experiments relating to infection of animals with pneumonic plague by inhalation, one would expect that the organism would have retained its maximum virulence throughout this epidemic.

For these reasons and, also, from the fact that the acute course and mortality of the disease were not changed toward the close of the epidemic and especially from the experimental proof furnished by the inoculation of animals with cultures isolated near the beginning and near the close of the epidemic, we must conclude that the sudden decline and cessation of the epidemic was not due to any marked change in the virulence of the strain.

Such a decline and cessation must have depended upon other causes. The plague bacillus, whether isolated from pneumonic or from bubonic epidemics, usually exhibits marked stability in virulence. While it is not a very resistant organism in nature and easily becomes destroyed under certain conditions, it usually does not become markedly attenuated in passage through the animal body, and even on artificial culture media, after many months, its virulence is usually fully retained. Instances of spontaneous loss of virulence in culture media have been reported, but this is not usually the case with fresh, virulent cultures. This quality of stability of virulence of the plague bacillus, so different, for example, from that of the cholera vibrio, is of particular interest from an epidemiological standpoint.

(To be continued.)

Reviews.

PELLAGRA, AN AMERICAN PROBLEM. By Geo. M. Niles, M.D. W. B. Saunders and Co., Philadelphia and London. 1912. Illustrated. Pp. 253.

Dr. Niles's book on "Pellagra" is timely in its appearance, for there seems no getting away from the fact that the disease has become a problem of serious issue in the United States of America. In bringing out a book on pellagra in a country where the disease has but recently appeared, an author has to remember that he is writing for men in the practice of their profession, who in their student days were even unfamiliar with the very name and far less with the clinical manifestations of the ailment. The author has to teach his medical colleagues as students are taught, beginning with the A. B. C. of the subject and leading them gradually on through the details of the disease. This the author has accomplished to the letter. He begins with what is known of pellagra in other countries, proceeds to discuss its appearance in the United States, and systematically sets forth the probable etiology, the clinical course, the pathology and morbid anatomy, the diagnosis, the prognosis, the treatment and the prophylaxis of pellagra. Each part of the subject has a chapter to itself, so that it is easy for a reader especially interested in any one portion to find what he wants to know. Dr. Niles has set forth our knowledge of pellagra up to date, and discusses the etiology of the disease with an open mind. He gives the pros and cons for the maize theory, and for Dr. Sambon's claim that everything points to pellagra being due to a parasite which is insect borne. He is inclined to the long-established belief in the connection between the consumption of maize and pellagra, yet he gives full prominence in the text to the more modern or presumed parasitic origin of the disease.

That pellagra has become a scourge in the United States of America is readily gathered from the fact that thirty-eight States acknowledge its existence within their confines. Some of these, markedly South Carolina, Georgia, and Louisiana, had each over 500 cases of pellagra, and in six others: Virginia, North Carolina, Alabama, Mississippi, Texas, and Illinois, over a hundred cases were known to exist. The seriousness of this infection is only known to those who have made themselves familiar with the nature and course of this disease. The mortality amongst those actually attacked is sufficiently alarming, but more trying still is the fact that the disease gradually disables the sufferers mentally and physically, that they become fit only for lunatic asylums; and, in fact, in pellagrous countries they form a large proportion of the inmates of asylums. The book is well printed, the illustrations are good, and we congratulate the author and the publisher upon supplying us with an admirable text-book on a disease which has recently appeared in Britain and spread in the United States of America to an alarming extent.

TREATMENT AFTER OPERATION. By William Turner, M.S., F.R.C.S., and E. Rock Carling, B.S., F.R.C.S., with a chapter on the Eye by L. V. Cargill, F.R.C.S. London: University of London Press. Published for the University of London Press, Ltd., by Hodder and Stoughton and Henry Frowde.

The authors believe there is a demand amongst practitioners for an account of the after-treatment of operation cases. They have therefore written this book in order to supply the want in a convenient and readily accessible form, and hope at the same time that it may prove useful to house-surgeons, senior students, and nurses.

The methods, directions, and data, the authors state in the preface, are those habitually employed or relied on by themselves, and no attempt has been made to include varieties of method or to indicate differences of opinion.

The book should prove of great value to those whose duty it is to see to patients after major operations. Many times a house-surgeon may not feel quite sure what he ought to do in such and such a case after operation, but now with this useful work by his side all such difficulties should vanish.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

SLEEPING SICKNESS IN THE PORTUGUESE CONGO: APPARENT CURES.

By MERCIER GAMBLE, M.D.
B.M.S. Hospital, San Salvador do Congo.

DURING the nine months, December, 1908, to August, 1909, I had forty-one unselected patients under treatment for trypanosomiasis, in whom the diagnosis was made from the microscopical examination of fresh gland juice, and the main treatment consisted in no fewer than 100 gr. of atoxyl, which was given subcutaneously in the forearms, usually in doses of 4 gr. daily. They were natives of the San Salvador* district of the Portuguese Congo; they submitted to treatment voluntarily and lived at their own expense. Except when they received their medicine they were not under observation, so that the regular taking of pulse-rates and temperatures was impossible. The ages given were estimated, the extreme weights were 25 lb. and 126 lb. Nineteen patients are alive and well. I frequently either see them or receive reports that they continue in good health.

(*a*) Thirty-five patients had no more atoxyl after August, 1909, but three had secondary treatment till December, 1909. Nineteen are dead, though one died after two years of good health, and possibly from other causes. Sixteen are alive and well.

(*b*) Six patients had no treatment from August, 1909, to October, 1910. The subsequent main treatment consisted of atoxyl, 7½ gr., twice weekly, in the gluteal region.

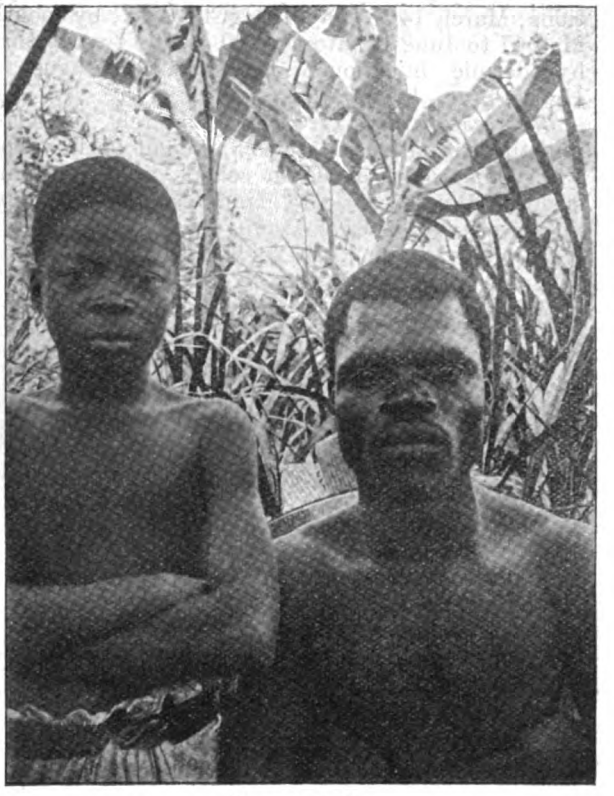
(1) Two are dead; one ceased treatment March, 1911, and died October, 1912; the other was found to be infected in November, 1911, and recommenced treatment but died April, 1912. (2) One is ill (January, 1913); he had two courses of atoxyl and two of perchloride of mercury between March and August, 1909. Being unwell in October, 1910, he received continuous treatment till April, 1912 (atoxyl 382½ gr., urotropine, perchloride of mercury, and arsenious acid). During this time he was a useful and intelligent workman, then, because of the onset of severe headache, he returned to his town. (3) Three are alive and well. Two ceased treatment March, 1911, and the third September, 1911.

A. T., male, aged 21; diagnosed December 3, 1908; felt unwell, and thought it was due to the enlarged cervical glands.

Treatment.—December 11, 1908, to January 11, 1909, atoxyl, 77½ gr. by thirty hypodermic injections; January 12 to February 25, $HgCl_2$, 5¾ gr., by mouth; February 21 to March 17, antim. tart., 36 gr., by mouth; February 26 to April 2, atoxyl, 88 gr., by twenty-three hypodermic injections; April 5 to May 7, $HgCl_2$, 3⅝ gr., by mouth; May 26 to June 13, $HgCl_2$, 3 $\frac{9}{16}$ gr., by mouth.

Progress during Treatment (1909).—January 25: gland juice fresh and stained negative; March: weight, 110 lb.; April: submaxillary gland juice, 30 minutes negative; May: engaged in heavy work, carrying in the hot, wet season; July: weight 115 lb.

Result.—November 2, 1910: weight 114 lb.; no sleeping, no fever; in ten days, went to the Coast (90 miles) and back with a three-quarter load, say 56 lb.; November 2, 1911: weight 118½ lb., well; November 29, 1912: weight 120 lb., well. In August he had repeated headaches, but they did not stop him hunting. His second child was born on August 31. Carrier to the Coast, October and December.



D. and A. T.
November 30, 1912.

M. K., female, aged 12; diagnosed January 9, 1909; obvious enlargement of cervical glands; sleeping.

Treatment (1909).—January 11 to February 24, atoxyl, 100½ gr., by thirty-eight hypodermic injections; February 25 to March 28, $HgCl_2$, 4 $\frac{13}{16}$ gr., by mouth; March 29 to May 3, arsenic 3⅖ gr., by mouth, and atoxyl, 8 gr., hypodermically; May 4 to June 1, atoxyl, 100 gr., by twenty-four hypodermic injections; June 11 to July 10, $HgCl_2$, 5½ gr., by mouth.

Progress during Treatment (1909).—January 27: Fresh gland juice, negative; February 27: not sleeping, able for farm work; March 29: weight 66 lb.; May 1: has joined a co-operative girls' farm

* "Notes on the District of San Salvador," JOURNAL OF TROPICAL MEDICINE AND HYGIENE, February 15, 1912.

club, and is quite able to do her share of the work; June 28: weight 66 lb.

Result.—July 29, 1909: returned home well and strong; November, 1910: weight 70½ lb., well, no headache, no fever; September, 1911: alive and well; September, 1912: alive and well, works regularly on farm; weight 84 lb.

N. L., female, aged 13. Symptoms: enlarged cervical glands; sleeping; no œdema of face; no hand tremors; very slight tremors tongue. Diagnosis January 27, 1909: fresh blood thick film, negative; cervical gland juice contained trypanosomes.

Treatment (1909).—January 30 to March 6, atoxyl, 90½ gr., by thirty-three hypodermic injections; March 14 to May 4, $HgCl_2$, 8 gr., by mouth; May 17 to June 11, atoxyl, 100 gr., by twenty-three hypodermic injections; June 28 to August 4, $HgCl_2$, 8 gr., by mouth.

Progress during Treatment.—March 15, gland puncture, negative; March 29, weight 65 lb.; April 13, seems to be dense in school, and sometimes sleeps; June, cervical glands small, puncture, negative; weight 61 lb.; August, weight 61 lb.

Result.—March 2, 1912: well, appears to be in splendid health, weight 88¾ lb.; November 29, 1912: reported alive and well; married in August.

M. N., female, aged 8. Symptoms: cervical glands enlarged; eyelids œdematous; tongue fine tremors; some epistaxis; skin healthy; no sleeping. Diagnosis February 16, 1909; gland juice contains trypanosomes.

Treatment (1909).—February 17 to April 1, arsenic, ¾ gr., by mouth; atoxyl, 53 gr., by nineteen hypodermic injections; April 12 to May 13, $HgCl_2$, 3½ gr., by mouth; May 24 to June 26, atoxyl, 88 gr., by twenty-two hypodermic injections; July 5 to August 4, $HgCl_2$, 5½ gr., by mouth.

Progress during Treatment.—March, weight 37 lb.; April 6, blood film negative; April 13, bright scholar; April 15, temperature 101.3° F., thick blood film contained no trypanosomes; June 28, weight 38 lb.; June 29, temperature 104.2° F., quinine; July 6, repeated fevers, looks thin and ill, abdomen protuberant, submaxillary gland contained no trypanosomes; August 12, weight 38 lb.

Result.—March 2, 1912, well, weight 48½ lb.; January, 1913, reported well.

N. V., male, aged 4. Symptoms: cervical glands enlarged, some œdema of face. Diagnosis February 16, 1909; gland juice contains trypanosomes.

Treatment (1909).—February 17 to April 7, arsenious acid, $\frac{3}{40}$ gr.; atoxyl, 24 gr., by ten hypodermic injections; April 12 to May 13, $HgCl_2$, 2⅛ gr., by mouth; May 24 to June 24, atoxyl, 76 gr., by nineteen hypodermic injections; July 5 to August 13, $HgCl_2$, $5\frac{3}{16}$ gr., by mouth.

Progress during Treatment.—March 29, weight 25 lb.; April 26, submaxillary gland puncture, 30 minutes, negative; June 1, sleeping in late afternoon, but is this due to playing by moonlight? June 28, weight 25 lb.

Result.—November 2, 1910, weight 28 lb., no fever, headache, or sleeping; March 2, 1912, weight 33 lb., well; January, 1913, reported well.

M. U., female, aged 6. Symptoms: enlarged cervical glands, sleeping occasionally. Diagnosis February 22, 1909; gland puncture showed trypanosomes.

Treatment.—February 22 to April 3, arsenic, $\frac{6}{10\,5}$ gr., by mouth; atoxyl, 54 gr., by nineteen hypodermic injections; April 12 to May 13, $HgCl_2$, 3½ gr., by mouth; May 24 to June 26, atoxyl, 88 gr., by twenty-two injections; July 5 to August 4, $HgCl_2$, 5½ gr., by mouth.

Progress during Treatment.—March, weight 39 lb.; April, ear blood, and gland juice showed no trypanosomes; bright, intelligent scholar; June, weight 43 lb.; July, weight 44 lb.

Result.—November 4, 1910, weight 42¾ lb.; no sleeping, headache, or fever; skin clear; November 2, 1911, weight 44½ lb.; some headache; May 30, 1912, weight 46½ lb.; apparently well; September 28, 1912, weight 50 lb.; some nasal discharge; December 28, 1912, has been under close observation for three months; well.

N. N., female, aged 11. Symptoms: cervical glands enlarged; œdema of face; tongue steady; no sleeping. Diagnosis February 9, 1909; fresh blood film, negative, fresh gland juice showed trypanosomes.

Treatment (1909).—February 10 to March 20, atoxyl, 86 gr., by twenty-five injections hypodermically; arsenic, $\frac{3}{10}$ gr., by mouth; March 21 to May 4, $HgCl_2$, 6 gr., by mouth; May 17 to June 12, atoxyl, 100 gr., by twenty-four injections; June 24 to July 23, $HgCl_2$, 5½ gr., by mouth.

Progress during Treatment.—March 29, weight 64 lb.; June 28, weight 65 lb.; August 3, weight 68 lb.

Result.—Repeated reports saying she is well; September 4, 1912, weight 98 lb.; well, works regularly; has grown in height.

M. Nd., female, aged 10. Symptoms: cervical glands enlarged; fever, no sleeping. Diagnosis March 3, 1909; gland puncture showed trypanosomes.

Treatment (1909).—March 8 to April 9, atoxyl, 54 gr., by thirteen hypodermics; April 10 to May 30, treatment interrupted by the rains; a few doses of $HgCl_2$, followed by twelve doses of arsenic, $\frac{1}{20}$ gr. May 31 to July 28, atoxyl, 113 gr., by twenty-three hypodermic injections; August 4 to August 14 $HgCl_2$, $1\frac{7}{8}$ gr., by mouth.

Progress during Treatment.—March 31 and June 28, weight 56 lb.

Result.—December 4, 1911, weight 65¾ lb.; looks well, no headache, fever, or sleeping; submaxillary gland juice, negative; November 12, 1912, alive and well; weight 70 lb.

D. K., male, aged 10. Symptoms: enlarged cervical glands; no sleeping. Diagnosis March 5, 1909; gland puncture showed trypanosomes.

Treatment (1909).—March 8 to April 9, atoxyl,

57 gr., by seventeen injections; April 12 to May 7, $HgCl_2$, $2\frac{1}{4}$ gr., by mouth; May 12 to June 19, atoxyl, 109 gr., by twenty-six injections; June 28 to July 24, $HgCl_2$, 5 gr., by mouth.

Progress during Treatment.—March 29, weight 47 lb.; April 13, general improvement quite obvious to his relations; June 28, weight 55 lb.; July 23, gland puncture and fresh blood film, both negative.

Result.—October 24, 1910, weight $58\frac{1}{2}$ lb.; December 30, 1911, weight $59\frac{1}{2}$ lb.; on his way to the Coast for loads, he returned well (January 15, 1912); September 2, 1912, weight 60 lb.; well; January 21, 1913, weight $61\frac{3}{4}$ lb.; well.

D., male, aged 8. Symptoms: cervical glands enlarged; thin, not sleeping. Diagnosis March 15, 1909; gland puncture showed trypanosomes.

Treatment (1909).—March 18 to April 9, atoxyl, 43 gr., by twelve injections; April 12 to May 18, $HgCl_2$, $4\frac{1}{2}$ gr., by mouth; May 24 to June 26, atoxyl, 88 gr., by twenty-two injections; July 5 to July 31, $HgCl_2$, $4\frac{3}{4}$ gr., by mouth.

Progress during Treatment.—March 29, weight 44 lb.; April, a smart lad, mentally and physically; June 28, weight 45 lb.

Result.—October 13, 1910, weight $53\frac{3}{4}$ lb.; well; October 12, 1911, well; entered my service as a personal boy; October 12, 1912, weight $64\frac{1}{4}$ lb.; for the past twelve months has worked and played like a healthy boy (see photo, page 81).

Z. V., male, aged 16. Symptoms: cervical and submaxillary glands much enlarged; sleeping, much fever, no headache; occasional general weakness; weight 80 lb. Diagnosis June 3, 1909; gland puncture showed trypanosomes.

Treatment (1909).—June 4 to July 9, atoxyl, 112 gr., by twenty-eight injections; July 19 to August 6, $HgCl_2$, 4 gr., by mouth; August 18 to December 15, he received, through the kindness of friends, two courses of arsenious acid and two of perchloride of mercury; the total amounts were: Liq. arsenicalis, 7dr. 50min.; arsenious acid, $4\frac{18}{20}$ gr.; perchloride of mercury, $10\frac{10}{16}$ gr.

Result.—November, 1910, no fever, no sleeping, strength returned; weight $102\frac{1}{4}$ lb.; November, 1911, well; weight $112\frac{1}{2}$ lb.; July, 1912, for several months has been a reliable stone-mason and builder, in daily work; weight $109\frac{1}{2}$ lb.; October, 1912, weight 116 lb.; admitted by examination into Evangelistic Training Institute.

S. N., female, born May 14, 1895. Symptoms: headache and fever; glands in neck; occasionally much œdema of face; no sleeping; weight 75 lb. Diagnosis June, 1909; gland puncture showed trypanosomes.

Treatment (1909).—June 11 to July 20, atoxyl, 121 gr., by thirty injections; July 27 to August 13, $HgCl_2$, $3\frac{7}{16}$ gr., by mouth; August 18 to December 15, through the kindness of friends she received two courses of arsenious acid and two of perchloride of mercury; the totals were: Liq. arsenicalis, 7dr. 5min.; arsenious acid, $5\frac{3}{20}$ gr.; perchloride of mercury, $11\frac{7}{8}$ gr.

Result.—October 15, 1910, weight $88\frac{3}{4}$ lb.; under close observation; well; November 30, 1911, weight $108\frac{1}{2}$ lb.; under close observation; well; November 29, 1912, weight $120\frac{1}{2}$ lb.; she has taken a high place in school, and helps in the dispensary.

M. D., female, aged 7. Symptoms: glands in neck; headache and fever; nasal discharge; supra-clavicular swelling not tender; not sleeping; illness of one month's duration. Diagnosis June, 1909: gland puncture showed trypanosomes.

Treatment (1909).—June 9 to July 20, atoxyl, 101 gr., by twenty-seven injections; July 29 to August 11, $HgCl_2$, $2\frac{7}{16}$ gr., by mouth.

Progress during Treatment.—June 28, 1909, weight 45 lb.; July 31, 1909, a bright and jolly girl.

Result.—October, 1910, well; November 27, 1911, well; June 25, 1912, well; weight $53\frac{3}{4}$ lb.; September, 1912, alive and well.

P. Mb., female, aged 10. Symptoms: glands in neck; not sleeping, has had some headache; weight 58 lb. Diagnosis June 12, 1909: gland puncture.

M. U. P. Mb.
G. D. M. Nl.

December 11, 1912.

Photographs of Five of the Sleeping Sickness Patients mentioned in text as apparent cures. Photos by Mercier Gamble.

Treatment (1909).—June 24 to July 27, atoxyl, 100 gr., by twenty-five injections; August 5 to August 13, $HgCl_2$, $1\frac{3}{8}$ gr., by mouth; August 18 to December 22, through the kindness of friends she received two courses of both arsenic and of mercury; the totals were: perchloride of mercury, $7\frac{9}{16}$ gr.; arsenious acid, $1\frac{87}{100}$ gr.; liq. arsenicalis, 12dr. 6min.

Result.—December 5, 1910, well; weight $66\frac{3}{4}$ lb.; September, 1912, alive and well, goes to farm daily; weight $80\frac{1}{4}$ lb.; December 4, 1912, health maintained.

A. V., male, aged 14. Complaint: glands in neck, headache, fever; no sleeping (?); weight 75 lb. Diagnosis June, 1909; gland puncture.

Treatment (1909).—June 12 to July 20, atoxyl, 109 gr., by twenty-seven injections; July 27 to August 13, $HgCl_2$, $3\frac{5}{16}$ gr., by mouth.

Result.—July, 1911, alive and well; June, 1912, alive and well; November 2, 1912, alive and well, in regular work as a stonemason; weight 115½ lb.

P. Mv., male, aged 12. Complaint: fever sleeping about four months, and glands in the neck. Diagnosis July 11, 1909.

Treatment (1909).—July 12 to August 13, atoxyl, 102 gr., by twenty-five injections.

Result.—July 27, 1912, no fever, no sleeping, working; January 3, 1913, well.

G. D., female. Complaint and symptoms: eructations, palpitations, dizziness; some œdema of face; tongue steady; pregnant six months. Diagnosis April 23, 1909; submaxillary gland puncture, one trypanosome found after twenty-five minutes.

Treatment (1909).—May 4 to June 1, atoxyl, 100 gr., by twenty-four injections; June 12 to July 11, $HgCl_2$, 5½ gr., by mouth; July 29 to August 13, atoxyl, 52 gr., by thirteen injections.

Progress during Treatment (1909).—June 1, palpitation and dizziness continue; June 28, weight 110 lb.; July 19, delivered of a premature child which did not survive.

Result.—October 29, 1910, weight 106 lb.; amenorrhœa.

Treatment (November, 1910 to September, 1911).—Attendance irregular; November to March, atoxyl, 157½ gr., by twenty-one injections of 7½ gr. into buttocks; March to May, $HgCl_2$, $3\frac{9}{16}$ gr., by mouth; June to July, atoxyl, 67½ gr., by nine intramuscular injections; July to September, very irregular attendance.

Result.—July 20, 1912, weight 106 lb.; January 11, 1913, well, but amenorrhœa continues.

M. Nl., female, aged 16. Complaint: glands in neck, two years; eyes heavy at midday, twelve months; amenorrhœa for periods of four months; headache and shivering fever; no strength; married September, 1908. Diagnosis June 29, 1909; cervical gland puncture negative; submaxillary gland puncture, showed trypanosomes.

Treatment (1909).—July 5 to August 5, atoxyl, 105 gr., by twenty-five injections.

Result.—November 19, 1910, regular, no headache, no fever, strength returned, weight 114 lb.

Treatment (1910 and 1911).—Attendance irregular; December 9, 1910, to February 6, 1911, atoxyl, 52½ gr., intramuscularly; January, 1911, urotropine, 255 gr., by mouth; March 3 to 20, 1911, atoxyl, 30 gr., intramuscularly.

Result.—July 20, 1911, child born; November 20, 1911, both well; July 20, 1912, mother well, 115 lb., but child thin; both loaded with round worms; November 16, 1912, both well, mother's weight 109 lb., probably because the child is still on the breast, and this is the planting season, which means heavy work.

S. M., male, aged 15. Diagnosis June 29, 1909; cervical gland puncture showed trypanosomes.

Treatment (1909).—June 29 to August 5, atoxyl, 107 gr., by twenty-seven injections.

Result.—August, 1910, weight 110¾ lb.; examination of fresh gland juice, negative; September, 1910, through the kindness of Dr. Broden, of the Leopoldville Clinical Laboratory, he was examined by lumbar puncture, and a slight increase of the lymphocytes was demonstrated.

Treatment (1910 and 1911).—October 31, 1910, to December 23, 1910, atoxyl, 97½ gr., by intramuscular injection of 7½ gr. doses; February 13, 1911, to March 3, 1911, atoxyl, 45 gr., by intramuscular injection of 7½ gr. doses.

Result.—March, 1912, alive and well; November 16, 1912, reported well, carrying and gardening.

From the above reports it may be seen that these nineteen natives are living useful lives and that they have had good health for from three and a half to four years. They appear to be cured. The method of treatment has, however, the great disadvantage that it requires a large amount of time. Therefore, since my return in October, 1910, I have given, as a rule, atoxyl, 7½ gr., twice weekly intramuscularly. Of a group of thirty-two, who commenced treatment that year, twenty-one are in good health. I hope to report on them when they have been longer under observation.

A CONTRIBUTION TO THE STUDY OF BILHARZIASIS.

By Professor Ivo Bandi, Naples.

During a tour of investigation, which I carried out in Egypt last year, I had the opportunity of collecting material for anatomico-pathological and parasitological researches on bilharziasis.

Among the questions which at the time principally interested me was that of the assumed existence of a species of *Schistosomum* which could be anatomically differentiated from the *Schistosomum hæmatobium* (*i.e.*, *S. mansoni* of Sambon).

I noticed at that time in the walls of a bilharzia affected bladder that both ova with terminal and lateral spines were present at the same time.

In investigations which I undertook during the present year in Southern Tunis I was able to study twenty-five cases of vesical bilharziasis at Gafsa, which is a most important centre of bilharizal disease,

The examination of the urinary sediment carried out on the spot showed, in all these cases, the existence of schistosomic ova with terminal spines only.

In a single case of intestinal bilharziasis which also came under observation at Gafsa only ova with terminal spines were again noted. Some months ago I received from Dr. Levy, of Sfax, a sample of bilharzial urine preserved with formalin, which had been

obtained from one of Dr. Levy's Arab patients who was suffering from a slight bilharzial cystitis. During my sojourn at Sfax I found it impossible to trace the patient: it was known, however, that he was living in a locality which was not recognized as being badly infected with bilharziasis. The examination of the sediment obtained by centrifuging this urine, demonstrated the presence in great scarcity of schistosomum ova of both varieties. This observation is of some importance as regards the debated question whether the two varieties of ova belong to the same species of *S. hæmatobium* or not.

Logically, and on the basis of experiments made, the separation of the two forms of bilharziasis (intestinal and vesical) as established by various investigators—amongst others Firket, Broden, Gunn, Holcomb, Letulle, Piraja da Silva, and Noc—does not appear to me to be sustainable, as it is based on the differentiation of the ova, which should invariably be with terminal spines in cases of vesical bilharziasis, and with lateral spines in intestinal bilharziasis.

To the observations of Looss, Ferguson and myself in Egypt, against Sambon's theory, should be added the observations of Conor, who, in Tunis—in the rare cases of intestinal bilharziasis which came under his observation—saw in some ova of both varieties and in others only ova with terminal spines. The two varieties of ova in a bilharzia cystitis in Tunis were first observed by me.

I believe that most probably Looss's opinion is the correct one—that both ova with terminal and ova with lateral spines belong to the same species of *Schistosomum*, which may become localized either in the bladder or the intestine, or both. It is to be noted that in Tunis, as shown by Catouillard and Gobert as well as by Conor and myself, the latter is very rarely met with.

HISTORICAL MEDICAL MUSEUM.

Mr. Henry S. Wellcome announced some time ago that arrangements had been concluded to hold the Historical Medical Exhibition at 54A, Wigmore Street, London, W., during the summer of 1913.

We look forward with great interest to what is certain to prove an exhibition of abiding interest. Mr. Wellcome, himself one of the greatest authorities on the history of all appertaining to the art of medicine, has had an expert staff at work for several years, obtaining information from every available source and collecting relics, drawings, instruments used in medicine and surgery in ancient, mediæval, and recent times. Egypt and Italy will no doubt contribute the major portion of the more historic objects of interest, for in these countries, more perhaps than any others, the art of medicine attained probably the highest development in former times.

This is the first time an exhibition of the kind has been held, at any rate in Britain, and it should prove both educative and interesting to the medical profession, as well as to others,

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Tropical Medicine and Hygiene

MARCH 15, 1913.

THE FAR EASTERN OLYMPIAD.

Athletics in Tropical Countries.

More than ordinary interest attaches to the recently concluded meeting of athletes held at Manila. The gathering was held under the auspices of the Far Eastern Olympiad, and was of an international character. Men of several races and nationalities competed, and perhaps never before has there been held an athletic gathering of such magnitude in the Far East, nor one in which so many varied types of human beings took part. It is impossible to form a definite idea of the athletic supremacy of any one race or nationality from a gathering of this kind, but it is a great advance from several points of view that natives of many countries at the present day assemble to test their relative prowess in friendly antagonism. At the Manila Olympiad the Chinese carried off several of the important prizes, and the averages of their success in the competitions are very high. Those who know the physique of the Chinamen are

prepared to expect their excellence in several departments of athletics, and those who have had an opportunity of witnessing their athletic abilities are also prepared to expect that in the future keen competition will arise between European and Chinese champions. Many Chinese lads in our schools in England have done well in certain departments of sport, and in one of the public schools competitions, in which the great public schools in England all took part, many will remember how one Chinese lad proved champion in at least two of the competitions. Curiously enough, this lad's brother did equally well in the following year, and several other Chinese students have proved capable of holding their own in this country and in the United States of America.

The next meeting of the Far Eastern Olympiad is to be held in Shanghai; here we may expect a yet more representative collection of athletes than in Manila, and it will be interesting to watch which of the nationalities best succeed.

These international sports are a new feature even in Europe, and yet more so amongst Asiatics and Africans. The area of contest is of widening interest; for not only international, but inter-racial, competitions will certainly be the feature of Olympiads in the near future. The three typical races of mankind—the white, the yellow, and the black—will vie with each other in athletics, and there can be no doubt as to the keenness of the contests.

Time was, and yet but the other day, when athletic sports in their highest sense were practised by British folk only. Slowly, very slowly, has sport found its way to the Continent of Europe, and it is still looked upon there as rather a frivolous chapter in the nation's health. Of late years, however, we have evidence that this idea is passing away, for we have seen Belgian and German oarsmen of high calibre at our boat-racing meetings, and keen footballers from France. Other nations have relied upon military training as the means of keeping their youths fit; but in Britain, where military training is the exception, we have to thank "sports" for preventing our race deteriorating to the lowest ebb.

With, however, the accession of not only other countries but other races competing with us in the athletic field, it behoves those interested in sport to look around and consider what are the prospects of the several races in the matter of success in athletic exercises.

To gauge the probable results of inter-racial competitions there are but few facts to go upon, hence it is difficult not only to attempt to prophesy, but also to discuss the subject with any prospect of arriving at even approximate truth. Recent contests have shown us that the negro can box, that the red man can run long distances, that an Indian Prince can play cricket, that the Chinese lads are successful competitors on the cross-bar and "horse," and there are several instances of the success of representatives of other races than the white in sport. The anatomist and physiologist from even the above bald statements may find data whereon to predict the sphere in which each racial type will specially succeed. The negro, heavy in build and slow in movement, with the flat calf and the prominent heel due to the long prominence of his *os calcis*, is not calculated to have success on the racing track or in any sport in which speed is a necessary feature. The place of the negro in sport can, therefore, be guessed at, if not conclusively settled, for Nature has not endowed him with the lightness required in many games, nor given him the "spring" required in such comparatively "still" sports as putting the shot, &c. Boxing and weight-lifting may be his, but from the anatomist's point of view he cannot go far beyond these.

The yellow race are of a different build to the negro; small-boned, light-framed, and capable of great muscular development, the Chinese and Japanese are fitted for athletics of a different kind to those in which the black race may succeed. Those who have seen the enormous muscular development of the lower extremities of the Chinese and Japanese can realize that in athletics they will be worthy competitors in such sports as sprinting and exercises in which smartness of movement and alertness are required. The absence of roads in China has caused much of the carrying trade of the country to be done on men's backs, and the custom of the better-off members of the community to travel in chairs borne on men's shoulders is common in China. The consequence is that in their loins and lower limbs the Chinese are strong in the parts of the body where strength tells. Man's natural strength lies in his loins and thighs, not in the upper extremities to which our modern gymnasia teachers devote so much attention to develop. The teachers claim that they add inches of increase to the circumference of the chest, whereas, more often than not, it is mere increased development of the muscles of the upper limb arising from the trunk that affords the apparent increase, and not the vital capacity of the lungs themselves.

If the science of eugenics has any real accuracy, the generations bred from weight-carrying ancestry must tell, and at the present time the Chinese are developed in that sense beyond perhaps any other peoples. That this will continue throughout another generation in China and Japan is questionable, for modern developments with railways, machinery, &c., will do away with the necessity for human beings continuing to do what in other countries are done by mechanical transport.

Inter-racial contests, however, are bound to become common in the immediate future at which black, white, and yellow races will contend; and there can be no doubt that there will be many heart-burnings in Europe and Northern America when the palm of victory is awarded to races other than white, who have hitherto been supreme in all matters appertaining to sport.

From the anatomist's point of view these contests are of great interest, and as the area of competition spreads so will the interest increase. The difference in physical type between the three distinctive races of mankind is sufficiently marked to enable the

scientific anatomist to understand aright what each is best capable of performing, and explain why one man, nationality, or race excels in certain branches of exercises and fails in others.

The international contests we see around us even now in so limited a degree have a scientific interest; and this will increase as years advance and the competitors come from different types of mankind. We are apt to regard these Olympiads as mere betting opportunities and dispose of them accordingly; but there is a deeper meaning to them which, when accurately gauged, is of supreme scientific interest.

J. C.

Annotations.

Spirillar Fever in the Darjeeling District.—Capt. A. M. Jukes, I.M.S., describes in a preliminary note in the *Indian Medical Gazette*, December, 1912, small localized epidemics of fever, some with high mortality, which had presented some difficulty of diagnosis. He had found a spirillum in the blood of the cases examined by him, and was inclined to regard this as a new form of spirillar fever, because of (1) the severity of the illness and the high mortality (eight deaths out of fourteen cases in one group, one out of three in another group); (2) duration of fever eight to ten days; (3) absence of relapses in those who recover.

Bed-bugs and Leprosy.—Skelton and Parham, in the *Journal of the Royal Army Medical Corps* for March, 1913 (vol. xx, No. 3), narrate some experiments made by themselves to ascertain what part the bed-bug plays in the transmission of leprosy.

Seventy-five bed-bugs (*Cimex lectularius*) caught on beds at Walezo Leper Asylum, Zanzibar, were teased out, and their intestinal contents examined microscopically for acid-fast organisms.

The technique employed was as follows:—

Live bugs which had been caught on beds in the Leper Asylum were placed in sterile tubes and washed for several hours in many changes of normal saline. The intestinal contents were teased out, and films were made of their contents and stained by the Ziehl-Neelson method, and decolorized for five to ten minutes in 2 per cent. sulphuric acid.

Acid-fast granules were found in one such preparation. They gave one the impression of the large *azure granules* in a large mononuclear leucocyte, but although the film was searched very carefully for several hours on two or three days, no further patches of acid-fast granules could be detected.

In two films, stained clumps of bacilli that were neither pink nor blue were seen. They were arranged somewhat like *Bacillus typhosus* in the spleen. It was thought that these organisms might have been slightly acid-fast bacilli, and that a 2 per cent. solution of sulphuric acid had only partially decolorized them.

One of the films, therefore, was restained with carbol-fuchsin and decolorized in 5 per cent. sulphuric acid in methylated spirit for ten minutes, and counterstained with methylene blue. On examination a few pink rods could be made out, but the majority were stained as in the first specimen. The rest of the film had completely lost the pink stain in the decolorizing fluid.

In another experiment 100 live bed-bugs caught at Walezo were washed in sterile normal saline by repeatedly shaking them up in two tubes for several hours. The fluid was then poured off and centrifugalized. Several films were made of the deposit and were stained with carbol-fuchsin and decolorized in 5 per cent. sulphuric acid in methylated spirit for ten minutes. No acid-fast organisms were detected after careful search for several hours. What was left after the fluid had been decanted, that is to say, the bodies, legs, and arms of the bed-bugs, were put into a mortar and ground up to a powder. Several films of this were stained and examined. No acid-fast organisms were seen.

It may be remembered that Much in his description concludes that the tubercle virus exists in three forms: (1) An ordinary bacillary form; (2) a non-acid-fast form showing granules in its interior; and (3) free granular forms. It may, of course, be possible that the granules we saw and the indeterminate bacilli were forms of the ordinary acid-fast *B. lepræ*.

The author's conclusions are as follows: (1) With the above exception it does not appear that the ordinary common bed-bug harbours any bacilli which morphologically resemble the *B. lepræ*.

(2) In these circumstances it does not appear probable that the bed-bug plays any great part in the transmission of the disease in Zanzibar.

Abstracts.

Studies on Pneumonic Plague.

The Pneumonic Strain of "Bacillus Pestis."

(*Continued from p.* 80.)

Agglutination Tests.—Theoretically the agglutination test has two applications in plague: (1) The diagnosis of the disease by the demonstration of antibodies in the patient's serum, and (2) the identification of the organism cultivated from a suspected case by means of the serum of an animal immunized against the plague bacillus.

In pneumonic plague, the agglutination test has no clinical value, for the patients succumb to the disease before antibodies are produced or at least produced in any quantities that are capable of detection.

With regard to the second application of the method, as there seemed to be some difference of opinion as to the value of the agglutination test in identifying plague bacilli, the authors decided, after their return to Manila, to carry out a series of experiments in the hope of throwing further light upon this subject.

Two points were strikingly obvious from this series of experiments: (1) There is great variability in the limits of agglutination of the different strains, and (2) the strains freshly isolated from experimental

animals agglutinate only at relatively low dilutions of the serum. It is also to be noted that both pneumonic strains and bubonic ones are agglutinated by the same serum.

During the course of these experiments they were able to identify promptly by the agglutination test two strains which were isolated from bubonic cases of plague dying upon ships in the harbour of Manila.

While one of the difficulties in the performance of the agglutination test with the plague bacillus is the tendency towards spontaneous flocculation, under proper conditions, spontaneous flocculation usually does not occur in freshly isolated strains; in most strains which have been grown upon artificial media for long periods of time it can be avoided by cultivating them at 37° C. The greater difficulty is to obtain a satisfactory immune serum. Several rabbits were given repeated intravenous injections of large doses of killed virulent culture without obtaining more than a trace of agglutination with their sera. The authors strongly recommend the use of a living virulent culture for the preparation of the immune serum.

If one has a satisfactory immune serum, the culture grown at 32° C., or even at 37° C., will be agglutinated promptly, and the control tubes will remain practically unchanged. Controls with normal serum should always be prepared in performing the test.

Infectivity of the Excreta.—In no other disease is the infecting organism found in such abundance in the sputum as it is in pneumonic plague. When the disease is well developed, *Bacillus pestis* is present in almost pure culture. In pneumonic plague as in bubonic plague, when the disease becomes septicæmic, the organisms are sometimes found in the urine and even sometimes in the fæces. When once the sputum of pneumonic plague cases becomes thoroughly dried it is no longer infectious, but when the sputum becomes frozen and pulverized, particles of it may be blown about and remain infective for long periods of time, or until the sputum is again thawed.

Examination of the Sputum.—A bacteriological diagnosis from the sputum cannot be made at the onset of the disease, and not until after the fever has developed does the sputum appear. Shortly after the appearance of the sputum, the plague organism, even if not visible from the microscopical examination, may be isolated by culture. When the sputum becomes bloody, the organism is usually present in large numbers and in almost pure culture. Sometimes the organism might be mistaken morphologically for *Diplococcus pneumoniæ*, and bipolar staining organisms, other than plague bacilli, may sometimes be encountered in the sputum. While in the microscopical examination of the sputum Gram's stain is a very valuable aid in arriving at a diagnosis of the organism, nevertheless Gram negative bacilli have been encountered in the sputum, which proved later not to be plague bacilli. However, usually if the sputum is blood stained, from the microscopical examination, with the aid of Gram's stain, there is no difficulty in arriving at a diagnosis, since the plague organism is usually present in such very large numbers. In the later stages of the disease, involution forms are commonly encountered in the sputum. The organisms are constantly found in great abundance up to the time of death.

Examination of the Blood.—In the early stages of the disease, cultures from the blood are frequently negative. Sometimes, however, the organism could be cultivated from the blood from twenty-four to forty-eight hours before death, and it could always be obtained from the blood a few hours before death. In many instances the bacteria are present in very large numbers in the blood, so that a diagnosis can often be made from a simple, microscopical examination. In no other disease is so marked a bacteræmia present. In the early stages of the disease, cultures from the blood should be made in bouillon, as much as 1 c.c. of blood being employed. The agglutination test is of no value in making a diagnosis, as the course of the disease is too acute and the patient has succumbed before the agglutinins appear in demonstrable quantities. The reaction of the deflection of the complement is also not to be recommended for the same reason; the examination of the sputum and blood for the presence of the bacillus gives much greater and more valuable information. In cases where no necropsy is permitted, and a *post-mortem* bacteriological diagnosis is advisable, microscopical examination of material, obtained by lung puncture with a syringe, may often be conclusive of pneumonic plague, *B. pestis* being present in the microscopical preparation, in enormous numbers, in pneumonic plague cases.

From the study of the human lesions and those produced experimentally in animals, it would appear that epidemic plague pneumonia results from inhalation, the primary point of infection being the bronchi. Along the bronchioles the infection extends by continuity directly into the infundibulum air cells, or by contiguity through the walls of the bronchioles to the contiguous tissue of the lung, and gives rise to a consecutive peribronchial inflammation in the tissues immediately surrounding the bronchioles. From these areas the infection rapidly spreads to the adjacent pulmonary tissue and visceral pleura. The bacilli rapidly multiply and produce at first pneumonic changes of the lobular type, and shortly afterwards from the fusion of several rapidly spreading areas more general lobar involvement of the lung tissue. The blood becomes quickly infected, and a true bacteræmia results in every case. Secondary pathological changes occur, particularly in the spleen, bronchial glands, heart, blood-vessels, kidneys, and liver. The fact that the bronchial glands at the bifurcation of the trachea are always much more severely affected than any of the other lymphatic glands argues against the theory that epidemic pneumonic plague is primarily a septicæmic disease, and that the lungs are infected secondarily from the blood. Moreover, in the

earliest stage of the disease, the blood may be free from plague bacilli. The tonsils may become secondarily infected in pneumonic plague, just as other lymphatic glands—for example, the bronchial ones—become so infected. However, in pneumonic plague, death occurs before any very marked macroscopic changes occur in the tonsils. There is no doubt also that the tonsils may become primarily infected in epidemics of pneumonic plague, just as has occurred in sporadic cases during epidemics of bubonic plague. This, however, is not the common channel of primary infection, and in such cases involvement of the lymphatic glands of the neck occurs early in the course of the disease. The fact that the œsophagus was found to be normal in every case examined and that the intestines showed only slight lesions constitutes another argument against the idea of the occurrence of primary intestinal plague infection in man, since in many of the pneumonic cases plague bacilli must have been repeatedly swallowed in the bronchial secretions and in the saliva.

Susceptibility of Animals to Pneumonic Plague.

Many cultures isolated by Strong and Teague during the Manchurian epidemic from the lungs at necropsy have demonstrated the same pathogenicity for animals as virulent bubonic strains of the plague bacillus. The pneumonic cultures have shown themselves to be particularly pathogenic for mice, rats, guinea-pigs, and monkeys (*Cynomolgus philippinensis*, Geoff.), these animals dying from the same doses and succumbing within the same period after inoculation as has been observed after infection with bubonic strains. Some evidence was introduced at the Conference held at Mukden that suggested that when the pneumonic strains were injected subcutaneously into the guinea-pigs, usually septicæmia was produced very quickly and typical buboes were not obtained. Moreover, it was affirmed that the guinea-pigs died within a shorter time after inoculation than in the cases in which bubonic strains were employed. However, in these instances it appears that the results were dependent upon the size of the dose inoculated, as much as one-half of an agar culture having been employed in the infection. The authors showed in Mukden that the cutaneous or subcutaneous inoculation of very small doses of the pneumonic strain into guinea-pigs gave rise to the typical lesions observed in these animals after inoculation with virulent bubonic strains, particularly to typical buboes, to miliary abscesses in the spleen, and to secondary septicæmia with hæmorrhages in the different organs. Statements at the Conference in this respect have since been borne out by extensive experiments performed in Manila, and it has been conclusively shown, in addition, that when guinea-pigs are inoculated with the pneumonic cultures by inhalation, they develop primary infection of the glands of the neck, with secondary septicæmia and occasionally secondary pneumonia, or, in some cases, primary pneumonia with secondary septicæmia. Very rarely does the spleen show miliary abscesses in such cases, the animals dying before such lesions develop.

In *monkeys* (*Cynomolgus philippinensis*, Geoff.), also, the cutaneous or subcutaneous injection of the pneumonic cultures causes typical bubonic infection. Monkeys infected by the same cultures by inhalation develop primary pneumonic plague with secondary septicæmia and without involvement of the glands of the neck.

Tarbagans.—There has been considerable evidence brought forward during the past in support of the view that plague has existed in epizoötic form among a species of marmot, the tarbagan (*Arctomys bobac*, Schreb). However, there has been no direct bacteriological proof of this fact, and nothing definite was known before in regard to the susceptibility of this animal to plague infection, though, according to Preble, Tchaoushow showed these animals were susceptible to plague infection. Strong and Teague's experiments on tarbagans were carried out in Mukden where, by the kindness of the Hon. Alfred Sze, Imperial Commissioner to the Plague Conference, they were supplied with these animals for experimental purposes. From experiments they were able to show for the first time that cutaneous or subcutaneous infection of the tarbagan with virulent cultures of the pneumonic strain gives rise in these animals either to an acute bubonic or to subacute and chronic forms of plague infection. In some instances it was shown by comparative experiments that the tarbagan seems equally as susceptible to cutaneous or subcutaneous infection as the guinea-pig, these animals dying in about the same time (two and one-half to five days after infection), and from the same doses of the organism. In these instances there are hæmorrhages about the point of inoculation, typical buboes, and swelling of the spleen. In other instances, after infection with the same organism and with the same doses, the tarbagans may suffer from subacute and chronic forms of plague infection. In three of these animals killed by chloroform from ten days to two weeks after infection, there were found at necropsy abscesses measuring several millimetres in diameter in the subcutaneous tissues or in the abdominal muscles, near the point of inoculation, and swelling of the inguinal glands, while the liver and spleen showed indurated, yellowish nodules also measuring several millimetres in diameter. Plague bacilli were present in small numbers in the abscesses and in the nodules in the spleen and liver. These animals, judging from their condition at the time they were killed, would probably have lived at least several weeks longer. The lesions present were similar to those which have been described in rats which have succumbed to chronic plague infection. It was shown that the tarbagan is also susceptible to primary pneumonic plague when infection has taken place by inhalation. Death then occurs three or four days after infection from primary pneumonia and secondary septicæmia. These experiments were performed with the species *Arctomys bobac* Schreb. It was also shown that another species of

marmot (*Spermophilus citillus*, Linn.), very common about Mukden and the vicinity, was susceptible to acute plague infection, these animals dying in from three to seven days after cutaneous or subcutaneous inoculation of small doses of the pneumonic strain and exhibiting at necropsy hæmorrhages about the point of inoculation, typical buboes, and acute, splenic tumour.

Donkeys.—Some evidence was introduced at the International Plague Conference to show that donkeys became infected with pneumonic plague during the epidemic. Dr. W. S. Yang reported to the Conference the death of ten donkeys, the first of which died with cough and expectoration of blood. In the case of one of these animals, a necropsy was performed, and cultures were made from the heart, spleen, lungs, and liver. All of these cultures were said to show plague bacilli. It was also announced that Doctor Otsuki in Fushun had observed at necropsy two donkeys in which there was hepatization of the lungs, in one in the right and in the other in the left caudal lobe. The pathological changes in the lungs were said to be similar to those seen in the cases of human infection. In regard to the question of plague infection in donkeys, the Conference resolved that the question of the occurrence of pneumonic plague in these animals should be made the subject of a special study with regard to their liability to the infection. Strong and Teague, accordingly, attempted to infect donkeys experimentally with pneumonic plague by spraying suspensions of virulent strains of pneumonic plague bacilli into a closed canvas bag, fastened about the donkey's head in such a manner that it was necessary for the animal to inhale the bacteria in breathing.

Although they never failed to infect guinea-pigs and monkeys with pneumonic plague by the same cultures which were sprayed into the nostrils of the donkeys, they were entirely unable to infect the donkeys, even when these animals were made to inhale air charged with the most virulent cultures of pneumonic strains of the plague bacillus for a period of as long as five minutes at a time. Therefore, they do not consider donkeys susceptible to pneumonic plague infection, and these experiments render it doubtful that these animals played any part in the dissemination of pneumonic plague during the Manchurian epidemic, and suggest that in the reported cases of pneumonic plague in donkeys the infecting organism was not *Bacillus pestis*, but, perhaps, some other organism of the hæmorrhagic septicæmia group.

Dogs.—At the Mukden Conference, one case of pneumonic plague infection in a dog, observed by Dr. Takami, was referred to in which there was pneumonia in the caudal lobe of the left lung. This dog was found in a house where seven people had died of plague infection. The Conference also resolved that the question of the occurrence of pneumonic plague in dogs should be made the subject of special study with regard to their liability to this infection. Accordingly, experiments were performed with this object in view. The results were as follows:—

On November 4, two fully-grown dogs were placed in a closed glass cage and a suspension of two 48-hour agar cultures of a virulent pneumonic strain of the plague bacillus was sprayed into the cage for two periods of two and a half minutes each after a brief interval between them. The first dog died on November 9, five days after infection. The necropsy showed there was pneumonia of both lungs. In the right lung all the lobes were involved. Only a small portion at the apex of the upper lobe did not show pneumonia. In the left lung, both lobes, with the exception of the apex of the upper lobe, were also involved. The pneumonia was in the stage of engorgement with the exception of small bronchial areas scattered throughout the lung, measuring from about 2 mm. to 1 cm. in diameter. These areas of bronchial pneumonia were greyish in colour on the surface of the lung, and on section they were greyish at the periphery and in the centre red and slightly granular. The areas were not wedge-shaped, but were circular in outline. Smears from the lungs showed comparatively few plague bacilli and a few streptococci. The large bronchi were not reddened. There was much mucus in the trachea, but the mucous membrane here was also not reddened. The cervical glands appeared normal. There was no œdema of the cervical tissues. The spleen was swollen, but contained no miliary abscesses. The liver showed cloudy swelling, and also contained no miliary abscesses. Microscopical preparations from the spleen showed a few plague bacilli. Cultures from the heart and lung developed numerous colonies of the plague bacillus.

The other dog died March 21, seventeen days after infection. He was considerably emaciated. The necropsy showed that the lymphatic glands were nowhere swollen. There were no hæmorrhages or œdema in the tissues about the neck. The trachea and larger bronchi contained frothy, reddish mucus. The left lung was normal throughout. The upper lobe of the right showed advanced hepatization throughout and sank when placed in water. Two greyish wedge-shaped infarcts, measuring from 1 to 1.5 cm. at the base, were present in this lobe. The whole lobe showed reddish-grey hepatization with beginning resolution. The middle and lower lobes were somewhat congested, but contained no pneumonic areas. Microscopical preparations from the lung showed a fair number of *Bacillus pestis*. No other organism was present in the lung, as was demonstrated by cultures. Microscopical preparations from the spleen showed a few bipolar forms and a number of involution forms of the plague bacillus.

Therefore, experiments upon dogs show that these animals are only moderately susceptible to pneumonic plague, but that, when exposed to severe infection, they may contract primary pneumonic plague and die of the disease.

Shibayama showed that dogs were not very susceptible to subcutaneous infection with the pneumonic strain, but that they sometimes succumbed from the subcutaneous inoculation of large doses or from intraperitoneal inoculation.

Pigs.—It was stated that over 300 pigs had died during the epidemic at Harbin, but there was no evidence presented which showed that the disease from which they succumbed was bubonic or pneumonic plague infection, nor was any evidence submitted which showed that the disease was not hog cholera or swine plague.

Method of Transmission and Spread of the Disease.

Richard P. Strong and Oscar Teague,* in their report of their researches during the Manchurian epidemic in 1910-1911, write that, immediately after establishing their laboratory in Mukden, experiments were undertaken with the idea of elucidating *the method of transmission of the infection in pneumonic plague and the manner of spread of the disease during the epidemic.*

The sputum of pneumonic plague patients in the advanced stages of the disease always contains enormous numbers of plague bacilli. The temperature of the hospital wards at Mukden was sufficiently low, so that the expired air became immediately condensed to a vapour which was clearly visible to the eye as it issued from the mouth, and frequently could be seen for a distance of 30 cm. or more from the face. In many of the patients advanced pulmonary œdema was present, and the respirations were sometimes very forcible and sometimes even stertorous. Therefore, experiments were carried on to show, first, whether in cases of pneumonic plague the specific organism of this disease became disseminated into the air by the expired air or vapour arising from the breath in ordinary or dyspnœic respiration, and, secondly, whether this organism was disseminated by moderate attacks of coughing in pneumonic plague cases in which the cough did not result in the expulsion of particles of sputum visible to the naked eye. These questions were studied extensively by means of exposing Petri dishes containing agar before undoubted plague cases, and of then identifying the organisms which developed on the media by the usual bacteriological methods and particularly by animal inoculations.

In the course of the experiments, on a number of occasions during coughing, small droplets or larger particles of sputum, visible to the eye, were expelled, and touched the surface of the media in the Petri dishes which were exposed before the plague patient. The study of these cultures obviously is not included in this part of the investigation. The Petri dishes containing agar were invariably exposed before cases of pneumonic plague with bloody sputum, in which enormous numbers of plague bacilli had been shown to be present. All of the cases before which the plates were exposed died of plague infection within twenty-four to forty-eight hours from the time of the exposure. Twelve series of experiments were performed in which eighty-two plates containing agar were exposed, and in seventy-eight the micro-organisms which developed upon them were studied as far as was practicable.

The experiments were performed in the following manner: The plates were sterilized in the hot-air sterilizer within a metal plate-holder. They were then removed, the agar cultures melted and poured in in the usual way, and, as soon as the medium was sufficiently hard, were replaced within the plate-holder, and taken to the bedside of the patient in whose sputum plague bacilli had previously been found. All of the attendants were asked to retire from the ward in order that as little dust as possible might be present in the air. The condition of the patient before whom the plates were exposed was noted, and during the exposure of the plate the character of the respirations was particularly observed and notes made of whether coughing or talking occurred. The time of the exposure of the plate and the distance from the patient were also recorded in each instance. After the exposure the plate was returned to the holder and placed in the incubator. Twenty-four hours later the plates containing the culture-media were examined for the appearance of colonies and the number of colonies counted, but the plates were not usually opened until after forty-eight or seventy-two hours. The colonies were then again counted and carefully studied. Any of the colonies which in any way resembled colonies of the plague bacillus were transplanted to slants of agar. The morphology and staining properties of the organisms on the plate and agar-slant cultures were then studied. In every instance in which the morphology was at all similar to that of the plague bacillus, or the organism decolorized by Gram's stain, it was inoculated either into mice or guinea-pigs. In a number of cases the colonies were so thick on the plate, or surface growths from contamination with bacteria from the air were so extensive, that the separate organisms could not be isolated and studied. In a few of these instances a suspension of the whole growth upon the plate culture was made, and a portion of the suspension either rubbed over the freshly scarified abdomen of a guinea-pig or inoculated subcutaneously into a mouse. On several occasions in which it seemed hopeless to determine whether the plague bacillus was present or not on the medium in the plate, owing to the extensive contamination of the culture with bacteria other than the plague bacillus, the guinea-pig so inoculated died of plague. In some instances the plate cultures were discarded because of very extensive contamination, probably from air organisms which covered the whole surface of the medium with a very thick layer of growth. The ideal method would have been to inoculate guinea-pigs by the cutaneous method with light scarification of the abdomen, with suspensions of the bacteriological growth on all those plate cultures in which the separate colonies could not be isolated, and in this manner, perhaps, in others of these plate cultures the presence of the plague bacillus might have been demonstrated. There is no more delicate test for the presence of the plague bacillus than this procedure, and its efficacy is very great even when

* *Philippine Journal of Science*, Section B, vol. vii, No. , June, 1912.

the few plague bacilli present are extensively overgrown by other micro-organisms. Unfortunately the supply of guinea-pigs was limited to those the authors brought with them and none could be obtained in Mukden during the winter. Since there were numerous other experiments to perform which also required the use of guinea-pigs while in Mukden, a very limited number only could be allowed for the present study. In the case of all of the organisms which suggested in any way the plague bacillus, and the colonies of which had been transplanted to agar slants from the plates, inoculations of guinea-pigs were made after the authors returned to Manila.

During the colder weather in Mukden the plates containing the agar, exposed before plague patients during ordinary respiration, were frequently entirely sterile. The plates were usually exposed vertically before the mouth and nose of the patient, the time of exposure varying generally between two and five minutes; usually the shorter period was employed. In the experiments performed in the earlier part of the investigation the plates were held at a distance of from 5 to 7 cm. to 90 cm. or 1 metre from the the mouth of the patient. Later in the experiments, when it became evident that in cases without cough during exposure no plague bacilli were encountered at the greater distances, they were exposed before cases which did not cough, usually at a distance of from 5 to 18 cm. in front of the mouth and nose. Before coughing patients the distances varied from 5 cm. to 2 metres. A summary of the details of the experiments is given in the report.

Of the eighty-two agar plates, eight were exposed in the wards in the neighbourhood of pneumonic plague patients; four before patients who talked during time of exposure, and thirty-five before patients who coughed during such time. In thirty-nine instances plates were exposed before patients who did not cough during the time of exposure, and, notwithstanding the fact that many of the patients suffered with marked dyspnœa and advanced œdema of the lungs, in only a single instance was the plague bacillus encountered in one of these plate cultures, although in a number of the experiments the surface of the medium was visibly wet by the vapour arising from the breath.

In this one case the conditions of the experiment were as follows:—

Three plates containing agar were all exposed at a distance of about 7 cm. and for two minutes before a patient with marked dyspnœa, who died two hours afterwards. A suspension of the bacterial growth upon one of these plates, which covered almost the entire surface of the plate, was made, and a portion rubbed with the side of a scalpel over the abdomen of a shaved guinea-pig and the skin then freshly scarified. The animal died of plague infection six and a half days later; there were inguinal buboes and miliary nodules in the spleen. The animals inoculated with the colonies from the other two plates exposed in exactly the same manner did not develop plague infection. The results obtained from the examination of this one plate are different from those obtained from the remaining thirty-eight plates exposed before patients who did not cough. Two possible explanations of the result suggest themselves: first, that the plague bacilli reached the medium on the plate exposed before the patient in the plague ward in some other way than by the expired air from the patient; and secondly, that the plate was infected with plague bacilli by the droplet method through the forced expirations of the patient during the time this one plate was exposed.

The remaining number of plates (35)—in four other instances the patients talked during the time of the exposure, but no plague bacilli were demonstrated on these plates—were exposed before patients who coughed during the time of exposure, and in fifteen instance colonies of plague bacilli developed on the media in the exposed plates. In some cases more than 100 colonies of this organism were obtained upon the media after a single cough, sometimes in almost pure culture.

Guinea-pigs, the abdomens of which had been shaved and extensively scarified just before the time of the experiment, were exposed before three cases of pneumonic plague for a period of two minutes and at a distance of 5 cm. from the mouth, the abdomen being placed toward the mouth. The breathing of the patients in all of these experiments was so laboured that the hair of the guinea-pigs waved back and forth in the breeze made by the expired air, but no cough occurred during the time of the exposure. The animals remained alive, and did not develop plague infection.

The results of our experiments are in accord with the well-known bacteriological facts that bacteria are not detached from moist surfaces by ordinary currents of air, but that when sudden and forcible currents of air are forced from a distance through narrow apertures, as, for example, from the trachea through the vocal cords, the tongue being against the gums and teeth, or through the lips, as occurs in talking or coughing, that small droplets of mucus, frequently invisible, may be emitted. The question of whether the expired air of patients afflicted with pulmonary tuberculosis was infectious was investigated particularly by Nägeli and Buchner, who demonstrated that such air was sterile. Flügge and his pupils, however, demonstrated that by coughing tubercle bacilli were emitted in droplets from about 40 per cent. of the tuberculous cases examined. Cornet and Meyer, after considering all of the experimental evidence, concluded that droplet infection did not play an important *rôle* in the dissemination of tuberculosis.

In pneumonic plague the conditions are very different, owing to the enormous numbers of plague bacilli which are present in the lungs and bronchi. In our experiments, performed with cases of marked pulmonary œdema, the conditions were also different. The opportunities for infection by means of the droplet method must be very great in a pneumonic plague ward. The distance from the patient that the air may be infected by droplets containing plague bacilli would apparently vary up to certain

limits, particularly with the strength of the cough, the amount of mucus in the throat and larynx at the time, the size of the droplets emitted, the currents of the air in circulation, and the temperature in the ward at the time.

Conclusions.

(1) During normal and dyspnœic respiration of primary pneumonic plague cases plague bacilli are not usually expelled by means of the expired air.

(2) During coughing of such cases, even when sputum visible to the naked eye is not expelled, plague bacilli in large numbers may become disseminated into the air surrounding the patient.

The idea that infection of doctors, nurses, attendants, &c., in plague hospitals is caused entirely by particles of sputum expectorated by the patient and visible to the naked eye is erroneous. It follows from these experiments that the wearing of masks and the proper covering of any surface of the skin where fresh abrasions are present are important personal prophylactic measures against plague infection. It also follows that the eyes should be protected against this manner of conjunctival infection by proper glasses.

Articles of clothing worn in the wards should be sterilized immediately after removal, since plague bacilli may be present, even though no particles of sputum may be visible upon them.

From these experiments, also, it is evident how dangerous an infective agent a pneumonic plague patient is. In no other disease is the individual so dangerous, and in no other disease does the danger from droplet infection approach that which exists in pneumonic plague. The number of plague bacilli expelled in droplets from pneumonic plague cases is probably far greater than the number of bacilli ever expelled by patients afflicted with tuberculosis, croupous pneumonia, diphtheria, or influenza.

Manner of Spread of the Disease.—During the epidemic the disease was evidently spread directly from man to man by droplet infection and by the more or less intimate contact of healthy individuals with an infected person. *Whatever may have been the primary source of the epidemic, its dissemination occurred entirely independently of tarbagans, rats, donkeys, or any other animals.*

The disease was introduced into uninfected villages and towns by the importation of individuals infected with pneumonic plague or by those in the incubation period of this disease. No definite bacteriological evidence, that healthy carriers of the disease with plague bacilli in their sputa existed during the epidemic, has been produced. Opportunity occurred to examine two healthy individuals who were supposed to have given rise to the disease in other persons, but who themselves remained healthy. The authors were unable to demonstrate any plague bacilli in their sputum, and it was not infective for guinea-pigs.

(To be continued.)

THE PERMANGANATE TREATMENT OF SNAKE-BITE.

LEONARD ROGERS (*Indian Medical Gazette*, December, 1912) criticizes the preliminary report, by Surgeon-General Bannerman, I.M.S., of the latter's experiments on the permanganate treatment of snake-bite. In the *resumé* of this work (*Indian Medical Gazette*, October, 1912) it was stated that "even four times the amount which serves to neutralize cobra venom in a test tube will not with certainty prevent fatal poisoning in an animal which has received 10 minimal lethal doses, and that the same quantitative relations obtained when *daboia* venom was used." In reality, writes Rogers, this afforded the strongest evidence in favour of the permanganate treatment. The full amount of venom obtainable from a fresh vigorous cobra is just about 10 minimal lethal doses for a man; yet by implication four times its weight of permanganate did in some cases prevent death in animals that had received so large a dose of venom. The cobra very seldom injects its full dose into the human subject, and quantities of permanganate very much larger than four times the weight of the venom, can be applied—the well-known necrotic effect on the tissues being nothing compared with the chance of saving the patient's life. As to daboia (Russell's viper) not much more than 1 minimal lethal dose for a man is injected from freshly caught snakes when allowed to strike; so that in Bannerman's experiments nearly ten times as much venom as is likely to be received by a human being was successfully neutralized by the small amount of permanganate used in the animals referred to—facts very much in favour of the treatment.

Rogers gives a table summarizing Bannerman's results on a number of dogs injected subcutaneously with cobra and daboia venom respectively, and shows clearly that the experiments show a uniform recovery rate of from 50 to 83 per cent. The test on dogs by subcutaneous inoculation was a very severe one, for in actual practice a ligature is practically invariably tied above the bite in human subjects, which at once checks the absorption of the venom.

In other experiments in which dogs were bitten by venomous snakes, the doses received by them would be so far in excess of anything possible in human subjects, who form the vast majority of cases in India, that they are of no practical value whatever. The experimental injections were made just under the skin, and the report emphasized the fact that under natural conditions the snake's fangs penetrate much more deeply, adding considerably to the difficulty of treatment. Rogers states that this is only true in those exceptional cases where a daboia, or possibly an *Echis carinata*, which have much longer fangs than the minute ones of cobras, happens to strike a fleshy part. In three-fourths of a large number of cases collected by him, the bite was on the hand or foot, nearly invariably on a finger, the dorsum of a foot, or the ankle, where there is no great depth of tissue, which makes

treatment easy. Moreover, the orifice of escape for the venom not being at the tip of the fang, but a little way up on the anterior surface; in such situations it would be very difficult for the snake to inject its full quantity of venom. Indeed, he had a record of a patient, successfully treated by Sir Lauder Brunton's snake lancet by a layman, after being bitten by a daboia in three places on the fleshy part of the upper arm.

Rogers's experiments with cats in 1903 showed clearly the value of permanganate treatment. Dogs were unsuitable for such experiments, for it was well known, as demonstrated by Fayrer's classical experiment, that they absorb cobra venom with extreme rapidity. If Bannerman's experiments are to be held to prove that the method is of no use in dogs, then in view of Rogers's greater success with cats, the question becomes whether the treatment is of any value in man, and this must ultimately be decided by actual experience. Rogers gives a table of twenty-one cases of snake-bite, in every one of which the snake was identified. The table includes a number of cases of bites by the commonest deadly snakes of India, cobras, kraits, and daboias. Of the twenty-one, twenty were recoveries—conclusive proof that the permanganate treatment has saved the lives of a number of persons bitten by undoubtedly poisonous snakes.

Such a lengthy series cannot be explained away by supposing that in none of them did the patient receive a lethal dose.

As to intravenous injection of antivenine, it must be borne in mind that to neutralize the full amount of venom that may be injected by a cobra about three-quarters of a pint of serum (probably containing a lethal dose of horse serum), is required.

Notes and News.

LIVINGSTONE COLLEGE AND THE LIVINGSTONE CENTENARY.

Livingstone College, which was founded in the year 1893, in order to give instruction to foreign missionaries in the elements of medicine and surgery, and constitutes a permanent memorial to Dr. Livingstone in the neighbourhood of London, has issued an illustrated souvenir in connection with the Centenary of Dr. Livingstone's birth, which took place at Blantyre in Scotland, on March 19, 1813. The souvenir contains two coloured portraits, one from an oil painting by Mr. Malcolm Stewart, and the other from a crayon drawing from a photograph, both of them in the possession of Livingstone College. These are considered by many to be the best portraits available. The souvenir also contains a tasteful reproduction of the Livingstone Memorial Poem from *Punch*, of April 25, 1874, which is reproduced by the courtesy of the proprietors; also an inscription from the tree in Central Africa carved by Livingstone's native followers at the place where his heart was buried. The actual inscription is now in the possession of the Royal Geographical Society. There is also a reproduction of the inscription on Livingstone's tomb in Westminster Abbey, and a collection of sayings from Livingstone's writings, besides a picture of Livingstone College.

The College is appealing for a sum of £10,000 in order to meet various needs, one of which is to clear off a mortgage of £3,500. £1,500 is needed for making certain improvements, whilst it is desired to raise £5,000 as the nucleus of an endowment.

Livingstone College has in the past received support from a very small circle of those who have been interested in its work. It is felt that the occasion of the Centenary is one when the public who recognize the great services rendered by Dr. Livingstone to the nation and to the civilized world may be glad to unite in the support of a memorial which could not fail to be in accordance with the wishes of Dr. Livingstone.

The fact that fifty-three missionary societies have at different times taken advantage of the course of training given at Livingstone College for the benefit of their missionaries, 446 of whom have been enrolled as students of the College, indicates that the work is arranged on no narrow basis, and should appeal to the wider circle who are joining in the celebration of the Centenary.

The family of Dr. Livingstone have from the first expressed their keen interest in the College, and given it their cordial support.

In many ways Livingstone College has also helped forward the cause of exploration and travel by the information which it has circulated concerning the laws of health and the preservation of disease in tropical climates. This has been recognized by the Royal Geographical Society on many occasions, and on December 17, 1912, the Secretary of that Society wrote stating that the Council "are fully in sympathy with the proposals of the Committee of the Livingstone Centenary Fund." Sir John Kirk and Sir Harry Johnson have both written warmly supporting this proposal.

Particulars concerning the College may be obtained from the Principal, Livingstone College, Leyton, E., who will also be pleased to give information concerning the souvenir which is issued, price 6d., and also concerning Centenary postcards which have been prepared from the two coloured portraits appearing in the souvenir. These may be obtained price 1d. each, post free 1½d.

The British Guiana Medical Annual for 1911 contains a number of interesting papers. The following is a list of the contents: (1) "The Narcotics and Stimulants of the Guianese Indians," by Walter E. Roth (Commissioner of the Pomeroon District); (2) "Trichosporosis Nodosa," by J. W. H. MacLeod, M.D. (Reprinted from the *British Journal of Dermatology*, April, 1912); (3) "A Case of Tinea Cruris in British Guiana," by J. H. Conyers, M.B., C.M.Edin.); (4) "Causes of Cough," by Mrs. E. M. Minett, M.B., B.S.; (5) "The Treatment of

Leprosy by Nastin and Benzoyl Chloride," by E. P. Minett, M.D., D.P.H.; (6) " Studies in Enteric Fever," by K. S. Wise, M.B., B.Sc., D.P.H.; (7) " The Frequency of Bacillus Violaceous in the Water and Milk Supplies of British Guiana," by E. P. Minett, M.D., D.P.H., D.T.M. and H; (8) " Review of the Milk Question in British Guiana," by K. S. Wise, M.B., B.S., B.Sc., D.P.H., and E. P. Minett, M.D., D.P.H., D.T.M. and H.; (9) " Myiasis," by F. E. Field, M.D., D.P.H. Part II.—" Clinical Notes," by Drs. Robertson, A. C. L. La Frenais, T. B. MacQuaide, F. E. Field, and K. S. Wise. Part III.—"Transactions of the British Guiana Branch of the British Medical Association for 1911 and 1912 " (App.). Part IV.—" The Public Health Statistics and Medical Institutions of the Colony " (App.).

Reviews.

THE BACTERIAL DISEASES OF RESPIRATION, AND VACCINES IN THEIR TREATMENT. By R. W. Allen, M.D., B.S.Lond., London: H. K. Lewis, 136, Gower Street. 1913.

In his preface the author describes the scope of the book. Most of the contained matter has already appeared as a series of articles in the numbers of the *Journal of Vaccine Therapy* from February, 1912, to January, 1913, inclusive. Fresh matter has now been added to these articles, while important additions have been made in the section dealing with pulmonary tuberculosis. One chapter (xi) is entirely new. The subject is an important one and the author, with his great experience of it, is certainly the man to write about it. The book is worthy of close study. Dr. Vincent's photographs and micro-photographs which illustrate the text are excellent.

THE BIOLOGY OF TUMOURS. (The Bradshaw Lecture delivered at the Royal College of Surgeons, December 5, 1912.) By C. Mansell Moullin, M.A., M.D., F.R.C.S., Consulting Surgeon to the London Hospital. London: H. K. Lewis, 136, Gower Street, W.C. 1913.

A very interesting account of present day knowledge of the biology of tumours. The author divides tumours up into two classes: (1) Those which spring from germ-cells and possess a more or less complete individuality; and (2) those which spring from somatic cells and are due to the escape from control of what remains to them of their primitive power of growth. The question of inheritance of tumours and other interesting points are also dealt with.

THE MOSQUITO, ITS RELATION TO DISEASE AND ITS EXTERMINATION. By Alvah H. Doty, M.D., formerly Health Officer of the Port of New York. Illustrated. New York and London: D. Appleton and Company. 1912.

A useful little manual on the mosquito, its relation to disease and its extermination. Educative manuals of this type are urgently required now, in order to make the laity take an intelligent interest in the subject.

Teaching in schools should also be adopted, for by training the children they will grow up fully realizing the importance of mosquito destruction. In the part of the manual dealing with remedies for bites, " clean fresh earth," whatever that may mean, should certainly be deleted as a remedy for relieving the discomfort of the bites—the dangers of tetanus are obvious. The manual is well illustrated, chiefly by means of Howard's well-known diagrams.

CLINICAL BACTERIOLOGY AND HÆMATOLOGY FOR PRACTITIONERS. By W. D'Este Emery, M.D., B.Sc. H. K. Lewis, Gower Street, London. Fourth Edition, 1912. Pp. xv. + 274. Price 7s. 6d. net.

Since its appearance in 1902, this book has gone through three editions. The purpose the author had in writing it in the first instance was to enable the practitioner, by giving exact methods of procedure, to acquaint himself with the various manipulations employed in bacteriology and hæmatology, and to help him in his everyday practice. The teaching is so precise in detail, and so readily understandable, that any practitioner, however elementary his training in methods of laboratory diagnosis may have been, is enabled to set to work and educate himself in all the essentials necessary for investigating the ordinary ailments he meets with in his practice. Part I deals with Bacteriology, Part II with Hæmatology, and Part III with Cytodiagnosis. With Dr. Emery's book at hand the practitioner is in a position to equip a small laboratory in his own home at a minimum cost, to prepare culture media and cultures, to stain specimens, and to recognize the stained organisms microscopically. In the hæmatology section of the work an accurate guide is given to ensure exact blood counts being made and to the interpretation attending to blood counts as a whole. The book is a useful one, well illustrated and clearly printed.

STUDIES IN SMALL-POX AND VACCINATION. By William Hanna, M.A., M.D., D.P.H., Assistant Medical Officer of Health for the Port of Liverpool; Visiting Physician to the Port Isolation Hospital. Bristol: John Wright and Sons, Ltd. London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd. 1913.

The author states in his preface that his studies on the subject of small-pox and its prophylaxis by vaccination have been the outcome of several years of observation of cases which have occurred in the City and Port of Liverpool.

Ample opportunity has been afforded for this study from the unique position of Liverpool as a shipping centre and the great tide of alien traffic which flows through it. The first and second parts of the work deal with the ever-important problem of the value of vaccination in preventing and mitigating attacks of this dreaded malady, and the inverse relationship of scar-area to severity of attack is pointed out. The final portion deals with concurrent small-pox and vaccination, a very important and interesting subject.

The author hopes that his book will appeal to medical officers of health, vaccination officers, and those in charge of infectious disease hospitals. In addition, he believes that general practitioners may find it useful in furnishing illustrations of cases of small-pox.

It is certainly handsomely illustrated by a very excellent series of photographs, which are highly realistic, and give a very clear conception of the disease, and as the written matter is equally good and clear the work undoubtedly has a good future before it.

A Treatise on Hygiene and Public Health, with Special Reference to the Tropics. By Birendra Nath Ghosh, L.M.S. (Cal. Univ.), and Jahar Lal Das, L.M.S. (Cal. Univ.); with an Introduction by Colonel Kenneth Macleod, I.M.S. (retired). Hilton and Co., Calcutta. 1912. All rights reserved. Price Rs. 3-8 or 5s. net.

This new addition to our list of text-books on Hygiene and Public Health, especially as it relates to the Tropics, will be welcomed. As Colonel Macleod says in his Introduction, the work is well fitted for use as a text-book in colleges and schools, and both medical men and laymen may derive instruction and profit from its perusal. Its exposition is clear and its arrangement orderly, and in all this the writer of the review agrees. There are wonderfully few statements in it with which one can find fault, though in the part dealing with infectious diseases a few minor inaccuracies appear. For example, there is no doubt about the malignant quotidian malaria parasites forming crescents. Again (p. 311) it is not the zygote that penetrates the stomach wall, but the travelling vermicule, and this latter body does not form a wormlike structure when it comes to rest there, but a rounded or oval one—the oöcyst. On p. 313 the statement is made that mosquito-proof houses are prohibitive in their cost and only applicable for some big houses and bungalows, and cannot be used universally. This is, of course, only partially true; many small houses can easily be fitted up with wire gauze at a comparatively small cost, and it is to be hoped that statements of this kind will not become fixed in the minds of the laity. On p. 317, *re* the cultivation of fish for keeping down mosquitoes, it is stated that the existence of "millions" *around* the islands of Bermuda and Barbados is the cause of the absence of malaria and mosquitoes in those places. These small fish, of course, are present in the fresh-water collections in the islands, not in the sea around them. Little points such as these make or mar a work, and therefore it is necessary to point them out. The work is not intended to replace any of the standard works on the subject, only to supplement them, and it should do this in a very satisfactory manner. The chapters on "Disposal of Refuse," "Sewage" and the "Dead," are all excellent, as are many of the others, and the authors must be congratulated on their successful effort.

The Secretary of State for the Colonies has appointed Lieutenant-Colonel Sir William B. Leishman, M.B., C.M.Glas., R.A.M.C., F.R.S., Professor of Pathology at the Royal Army Medical College, London, to be a member of the Advisory Medical and Sanitary Committee for Tropical Africa.

Personal Notes.

India Office.

From January 25 to March 1.

Arrivals reported in London.—Lieutenant-Colonel R. H. Castor, I.M.S.; Major W. D. A. Keys, I.M.S.; Captain N. D. Mackworth, I.M.S.; Captain J. G. F. Paterson, I.M.S.; Captain J. A. S. Phillips, I.M.S.; Captain H. Ross, I.M.S.; Major T. E. Watson, I.M.S.; Lieutenant-Colonel L. F. Childe, I.M.S.; Captain A. N. Dickson, I.M.S.; Captain J. Woods, I.M.S.

Extensions of Leave.—Lieutenant-Colonel C. Duer, I.M.S., 6 m.; Major M. MacKelvie, I.M.S., 5 m.; Captain C. F. Marr, I.M.S., 8 d.

List of Indian Civil Officers on Leave (including Military Officers under Civil Rules).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Castor, Lieutenant-Colonel R. H., I.M.S., Burma, 6 m., November 26, 1912.
Childe, Lieutenant-Colonel L. F., I.M.S., Bo., 12 m., January 19, 1913.
Hirsch, Captain L., I.M.S., M., 18 m., January 2, 1913.
Keys, Major W. D. A., I.M.S.
Mackworth, Captain N. W., I.M.S., Behar and Orissa, 15 m., November 18, 1912.
Molesworth, Lieutenant-Colonel W., I.M.S., M., 12 m., December 15, 1912.
Nutt, Captain H. R., I.M.S., U.P., 12 m., September 19, 1912.
Pridmore, Lieutenant-Colonel W. G., I.M.S., Burma, 24 m., December 11, 1912.
Robinson, Lieutenant-Colonel W. H. B., I.M.S., 12 m., November 7, 1912.
Ross, Captain H., I.M.S., U.P., 24 m., November 20, 1912.
Weinman, Major C. F., I.M.S., B., 18 m. 14 d., October 3, 1912.

List of Indian Military Officers on Leave.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Dawes, Major C. D., I.M.S., to December 24, 1913.
Dickson, Captain A. N., I.M.S.
Middleton-West, Captain S. H., I.M.S., to December 10, 1913.
Nelson, Captain J. J. H. I.M.S., to December 13, 1913.
Paterson, Captain J. G. F., I.M.S.
Phillips, Captain J. A. S., I.M.S.
Quirke, Captain M. J., I.M.S., to May 28, 1913.
Sharman, Major E. H., I.M.S., to July 31, 1913.
Watson, Major T. E., I.M.S.
Woods, Captain J., I.M.S.

Dr. E. W. Graham, Senior Medical Officer of Northern Nigeria, has been transferred to the Gold Coast Colony.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the Journal of Tropical Medicine and Hygiene should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

POROCEPHALIASIS IN MAN.

By Louis W. Sambon, M.D., F.Z.S.
Lecturer to the London School of Tropical Medicine.

(*Continued from p. 374, vol. xv*, 1912.)

Description of Parasite.—Porocephalus clavatus, Wyman (figs. 9–12) is greyish-white in preserved specimens and yellow-tinged during life. Its body is claviform, elongated, more or less incurved. The cephalic extremity is rounded anteriorly, somewhat flattened ventrally and strikingly gibbous on the dorsal aspect. The tapering posterior portion terminates with

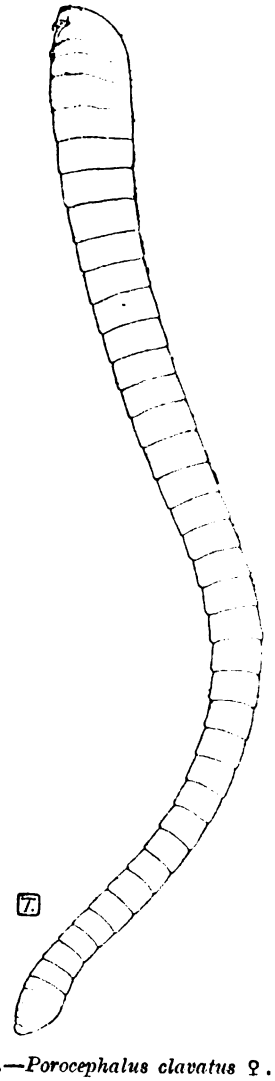

Fig. 9.—*Porocephalus clavatus* ♀. × 2

a slight, bulb-like obconical expansion. The largest female specimen examined by me measures 75 mm. in length, 4½ mm. across the widest part of the anterior extremity, and 2½ mm. across the narrowest part of the posterior end just before the terminal swelling, the diameter of which is 3 mm. My largest male specimen measures 25 mm. in length and 2 mm. in greatest width. Larger specimens have been observed. Thus Leuckart mentions a female 80 mm. long and a male 36 mm. long; and Wyman, a female 89 mm. long and a male 38 mm. long. The annulation is distinctly visible throughout the length of the body except on the dilated terminal portion. It consists of from 35 to 40 and occasionally 43 or 44 annuli, gradually diminishing in size posteriorly. Van Beneden counted 35 to 37 in his specimens, MacAllister 40 to 45, Leuckart "about 40," and Leidy "40 or fewer." Stiles found 35 to 43 annuli in females, 38 to 40 in males. In fully distended mature females the annulation becomes almost effaced and the closely packed and tangled coils of the enormously elongated uterine tube show quite clearly through the thinned, transparent cuticle. The cephalothorax is short (about 2 mm. long in my largest specimen) rounded anteriorly, slightly convex, flat or concave on the ventral surface, prominently

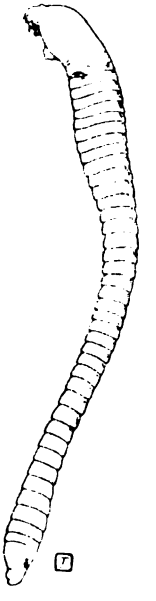

Fig. 10.—*Porocephalus clavatus* ♂. × 3.

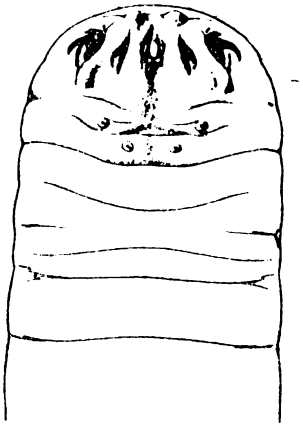

Fig. 11.—*Porocephalus clavatus* ♀. Ventral aspect of cephalothorax.

convex on the dorsal surface. The mouth is almost oval. The hooks are about equal in size, sharply curved and with robust points, they are longitudinally striated and measure about ½ mm. in length. The inner hooks are simple, but the two outer ones are each provided with a permanent, almost straight accessory-spine, placed on their back, like the point over the hook of a boat-hook, or the spear over the axe of a halberd.

The anal and reproductive orifices in the female open conjointly in a subterminal slit placed on the mid-ventral surface, with its long axis transversely to that of the body. In the

male, the anus is subterminal, the sexual opening is at the anterior end of the body on the first or second abdominal segment. It is plainly visible in the mid-ventral line, forming a prominent cone tipped by three papillæ: two anterior, one posterior.

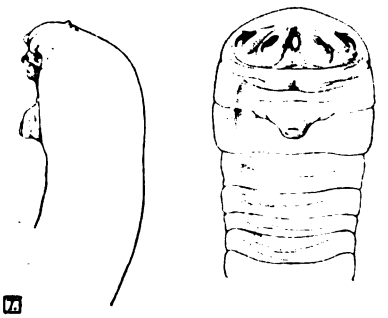

FIG. 12.—*Porocephalus clavatus* ♂. Showing genital opening.

V.—*POROCEPHALUS STILESI* (Sambon, 1909).

SYNONYMS.

1824.—*Pentastoma proboscideum*, Bremser (in part only).
1850.—*Pentastomum proboscideum*, Diesing (in part only).
1852.—*Linguatula quadriuncinata*, Mayer (in part only).
1893.—*Porocephalus crotali*, Stiles (in part only).

ZOOLOGICAL DISTRIBUTION.*

Adult Form.

**Lachesis mutus* (Linn.), Surucucu or Bush-master.
Lachesis lanceolatus (Lacep.), Rat-tailed pit-viper or Fer-de-lance.

Nymphal Form.

Unknown.

GEOGRAPHICAL DISTRIBUTION.

Central and Tropical America.

ANATOMICAL HABITAT.

Lungs.

HISTORICAL ACCOUNT.

This species was collected by Natterer in 1821, at Ypanema (S. America), from the lungs and body cavity of *Bothrops jararaca* (= *Lachesis lanceolatus*), and depicted by Bremser (1824) in his "Icones Helminthum," pl. X, figs. 22-24, where it erroneously appears together with *Linguatula subtriquetra* under the name of *Pentastoma proboscideum*.

Diesing (1835) enumerates *Bothrops jararaca* (=*Lachesis lanceolatus*) amongst the hosts of *Pentastoma proboscideum*, and of the figures he gives to illustrate this species some (pl. III, figs. 37-41) are of linguatulids taken from the lungs of *Lachesis lanceolatus*, others (pl. IV, figs. 1-10) from linguatulids found in the body cavity of the Great Teju (*Tupinambis teguexin*).

Mayer (1852) mentions finding twelve specimens of this species in the lungs of a *Lachesis rhombeata* (= *L. mutus*). He does not describe these linguatulids, but merely states that they were "quite similar to those found by Humboldt in the lungs of *Crotalus durissus*." Mayer suggests changing the name of *Pentastoma proboscideum* Rud. into that of *Linguatula quadriuncinata*. He does not propose the new name as a particular specific designation for the linguatulids of the Bush-master (*Lachesis mutus*), but only as a more appropriate name for the parasite discovered by Humboldt in the Cumana rattlesnake (*Crotalus terrificus*), and to which, like Bremser and Diesing, he ascribes also the linguatulids of the viperine snakes belonging to the genus *Lachesis*.

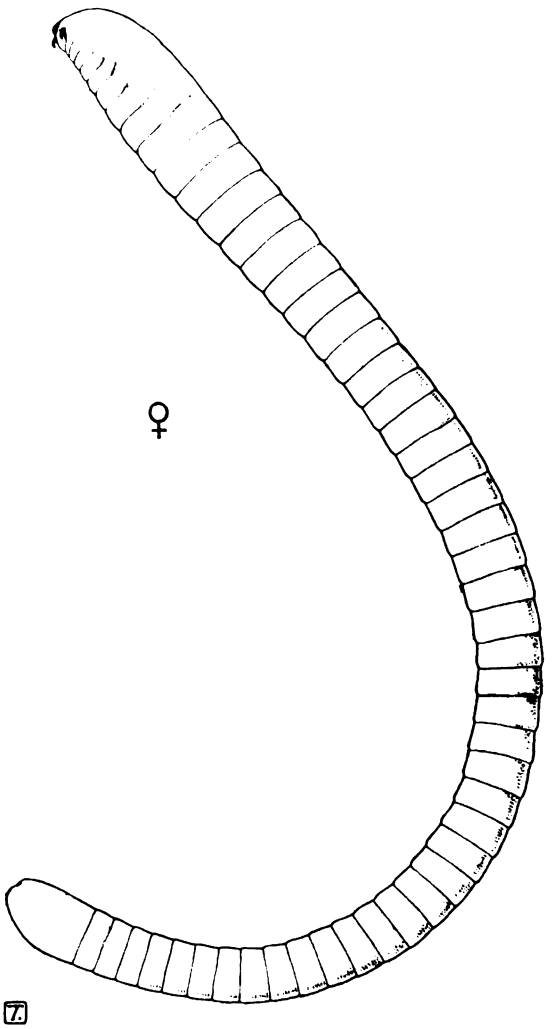

FIG. 13.—*Porocephalus stilesi* ♀. × 2.

Cobbold (1859), in *Transact. Linn. Soc.*, vol. 22, p. 164, states that he had the opportunity of examining a specimen of *Pentastoma proboscideum*,

* Signifies that I have examined specimens of the parasite from the host in question.

found by Mr. Edwards, of Edinburgh, in the mesentery of an undetermined species of *Bothrops*, but was unable to add "any new or otherwise interesting facts."

Description of Parasite.—Though more uniform in diameter throughout and with a more rounded terminal swelling, *Porocephalus stilesi* (figs. 13, 14 and 15) is similar in form of body and general appearance to *Porocephalus crotali* (*sensu stricto*) and *Porocephalus clavatus*, Wyman, but differs from both in the number of annulations. These, which are over 80 in *Porocephalus crotali* and only about 40 in *Porocephalus clavatus*, number from 45 to 50 in *Porocephalus stilesi*. I have had the opportunity of examining several specimens of both *Porocephalus clavatus* and *Porocephalus stilesi*, some collected by myself at the London Zoological Gardens, others

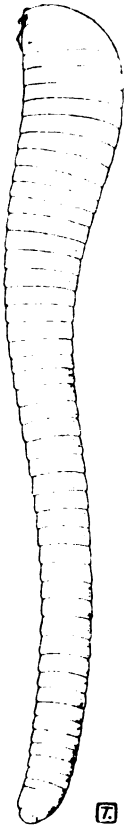

FIG. 14.—*Porocephalus stilesi* ♂. × 3.

preserved in the museums of London and Paris, and I have found the above mentioned ring numerations to be quite constant in the respective species.

In some Tongueworms, such as *Porocephalus armillatus* and *Porocephalus moniliformis*, the number of annulations is always greater in the female; in others, as for instance in *Porocephalus teretiusculus*, according to Spencer (1893), it is greater in the male (♀ 65—70, ♂ about 88). In both *Porocephalus clavatus* and *Porocephalus stilesi* there seems to be no numerical difference in the annulation of the two sexes save that of individual variation which, within restricted limits, is common to all species. Thus, in nine examined specimens of *Porocephalus clavatus* the numbers were as follows: ♀—35, 38, 38, 40, 43; ♂—35, 36, 39, 41; and in twelve specimens of *Porocephalus stilesi*, ♀—45, 45, 46, 47, 48, 50, 50 or 51; ♂—46, 46, 47, 47, 49. The examined specimens of *Porocephalus clavatus* were taken from various specimens of *Boa constrictor* captured in different localities. Those of *Porocephalus stilesi* were taken some from various specimens of *Lachesis mutus* from Trinidad and others from various specimens of *Lachesis rhombeata* from different parts of Brazil.

The largest mature female specimens of *Porocephalus stilesi* examined by me measure from 80 to 96 mm. in length by 5 to 6 mm. across the widest anterior portion, and 4½ to 5 mm. across the widest portion of the terminal swelling. The narrowest portion of the body measures about 4 mm. The largest male specimens 30 to 38 mm. in length, by 3½ to 4 mm. across the anterior end, and 1½ across the narrowest part of the posterior extremity.

The mouth is ovoid and placed with the narrowest end foremost. The outer hooks measure ½ mm. in length, and are provided with a straight, pointed accessory spine. The inner ones are simple and slightly larger.

The anal and sexual orifices in the female open conjointly in a subterminal slit about ½ mm. long placed on the mid-ventral surface with its long axis transversely to that of the body. In the male the reproductive opening is on the first body ring.

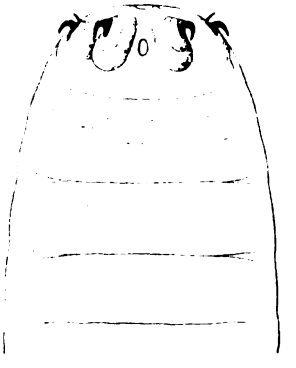

FIG. 15.—*Porocephalus stilesi*. Ventral surface of cephalothorax.

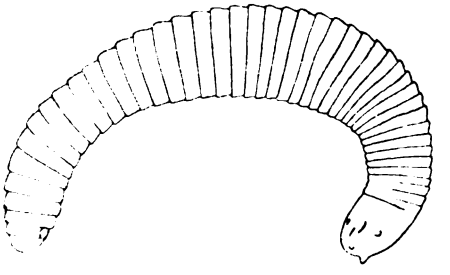

FIG. 16.—*Porocephalus wardi* after Diesing.

VI.—*POROCEPHALUS WARDI* (Sambon, 1909).

SYNONYMS.

1835.—*Pentastoma proboscideum*, Diesing (in part only).

1850.—*Pentastomum proboscideum*, Diesing (in part only).

1898.—*Porocephalus crotali*, Shipley (in part only).

ZOOLOGICAL DISTRIBUTION.

Tupinambis teguexin (Linn.), Common Teguexin or Great Teju.

GEOGRAPHICAL DISTRIBUTION.

South America.

ANATOMICAL HABITAT.

Found in abdominal cavity.

Historical Account.

This linguatulid (fig. 16) was found by Natterer, in the abdominal cavity of a *Podinema teguexin* (*Tupinambis teguexin*). Two males and one female were found 3 in. to 6 in. long. They are mentioned by Diesing and ascribed to the species (*Porocephalus crotali*) found by Humboldt in *Crotalus terrificus*. They are even delineated on pl. IV, figs. 1-10, as illustrations of this species together with other linguatulids from *Bothrops jararaca* (*Lachesis lanceolatus*).

Diesing (1850), in his "Systema Helminthum," again mentions the Great Teju amongst the hosts of *Porocephalus crotali*.

Shipley (1898), following Diesing, also mentions *Tupinambis teguexin* amongst the hosts of *Porocephalus crotali*.

Diesing's drawings of the linguatulid of the Great Teju, coupled with the very scanty information given in the text, show that the parasite is an immature form, 7 to 13 mm. long, with about forty-five rings, and in no way corresponds to either *Porocephalus crotali* (*sensu stricto*) or to any of the other species (*P. clavatus*, *P. stilesi*) already separated from it. Therefore, in 1909, I suggested that it might be a distinct species, and proposed for it the name of *Porocephalus wardi*.

SOME NOTES ON TROPICAL DISEASES OBSERVED IN THE REPUBLIC OF COLOMBIA.

By Dr. J. Martinez Santamaria.
Bogota, Colombia.

The following short note is written about certain diseases which are of interest owing to their clinical manifestations or to their being unknown in Europe.

Bubas (Yaws, Tropical Framboesia).—A disease limited to some of the warm regions of the Republic and *absolutely* unknown in the cold districts. It is a quickly spreading disease and is contracted by children more easily than by adults. It is spread either by direct contact or is mechanically transmitted by flies or mosquitoes; and it very often happens that a whole family in a house is affected.

The disease always appears as a small nodule near the mucous surfaces or at the edges of wounds, and it never has a genital origin. The nodule grows and ulcerates, forming what is called amongst us "Buba madre" (Mother of Buba). Later on the disease generalizes with or without fever, showing a granulomatous framboesiform eruption. This is followed by a calm period, which in turn is succeeded by crops of "bubas," ending in the second or third year by giving the patient complete immunity.

In the purulent yellowish liquid covering the ulcerations the spirochæta of Castellani is always found in abundance.

In the localities where the disease is endemic fowls are often affected by a severe epidemic condition very similar to the human "bubas." This disease is characterized by the appearance of a quickly-growing granulomatous nodule on the cockscomb, which is followed by several others near the ear and eyelid. The head swells, the nodule ulcerates, the animal develops a peculiar appearance, and dies in a week's time. The *post-mortem* does not show any microscopical change in the organs. All researches to find the specific germ have failed; but the inoculation of fowls from the serum, pus, or liquid has been successful, the symptoms appearing in between five and eight days.

Toro unsuccessfully inoculated human "bubas" into fowls.

Bubon de Velez.—A contagious disease only known in the Province of Velez, from which it derives its name.

This disorder commences with a small nodule near the mouth or nose. It quickly develops and ulcerates, spreading all over the nearest tissues and destroying them. The clinical appearance is that of tubercular lupus. No surgical or medical treatment is able to stop or modify its development, and the patient dies from septicæmia or intercurrent disease.

It is sometimes observed that new nodules appear in the course of the disease far away from the original one; and these are of an analogous symptomatology to that previously described.

Espundia.—This name is given to a disease characterized by the appearance of one or more nodules in the skin of the head, face, hands, and feet. The nodule is generally hard, about the size of a pea, and attached to the skin by a long pedicle. It suppurates, leaving, as a rule, a small erosion, difficult to heal.

The only way to effect its cure is the incision of the nodule. Our country people obtain the same result by making a strong ligature with a hair.

Carate (Pinta).—This skin disease is endemic in hot and damp districts and attacks men, women, and children without distinction. The disorder begins with the appearance of small chromatic patches on the face, thorax, abdomen, arms and legs, which spread over a large area, staining it black, white, or blue, and there are frequently to be seen on one patient two or three discolorations at the same time.

The characteristic of the patches is that they are chromatic and exclusively localized to the skin, while no itching or pain is produced.

Montoya y Florez has isolated three varieties of *aspergillus* corresponding to each of the three types of carates. Those fungi, cultivated in a proper medium, grow, producing blue, black, and white pigment.

Urticaria.—A tree grows in our forests known as "Pedro Fernandes" and "Mansanillo," under the shade of which nobody can rest, as they are attacked generally on the exposed parts of the body by urticaria, which is extremely painful. In the majority of cases the trouble disappears within twenty-four hours, but it is not infrequent to see patients suffering for two or three days.

This tree contains a substance analogous to that of the "urtica urense," which, when it comes in

contact with the skin produces the above-mentioned phenomena.

Syphilis.—This disease acquires an exceptional virulence in the hot districts; primary and secondary lesions are soon over; the tertiary stages in most cases produce bone lesions and gummata.

Lepra (Leprosy).—This was unknown in Colombia before the Spanish Conquest, when it first appeared.

It occurs in both cold and warm districts, and is most frequent amongst persons subjected to sudden changes of temperature, such as cooks, ironers, bakers, &c. The clinical forms usually seen are the tubercular and the maculo anæsthetic types.

Our patients are kept in lazarets, and those who were treated ten years ago with Carrasquila's serum have improved considerably.

Sometimes patients get well with no treatment at all, and others after having small-pox or erysipelas.

Fish cannot be considered as the cause of this disease, as in most of the places where it is endemic fish is not used as food.

Fiebre amarilla (Yellow Fever).—This occurs endemically and at long intervals along the Atlantic Coast, Cúcuta, all along the shores of the Magdalena River, and at the Muzo Emerald Mines. The last focus is important, as it is situated right in the middle of the country, and in an uncultivated and isolated zone, with no possible communication with the Magdalena River, from which it is separated by thick and immense forests. The epidemic there is quite independent of the other focus. For the last ten years we have not had a single case in the Magdalena zone, while in Muzo three epidemics have been recorded.

Fiebre recurrente (Relapsing Fever, discovered amongst us by R. Franco).—We have the European as well as the African form, but the latter is, perhaps, more frequent. In all the cases studied by us the spirochæta has been found, and the experimental inoculations performed on white mice by R. Franco and G. Toro have been positive at the third day, with no fever reaction, the parasite disappearing from the blood in the course of twenty-four to forty-eight hours.

In most of the cases it has been observed that on the eighth or ninth night before the appearance of the fever the patient has passed a very bad night owing to the bite of "Chinches" (*Ornithodorus moubata* (?*) Post-febrile sequelæ may be got in some cases, iritis often being noticed.

Paludismo (Malarial Fever).—All its varieties are known in Colombia. Some of its clinical types predominate in special zones. In Puerto Wilches, Chucuri, Patiachoco, &c., pernicious forms are endemic, while in other places the mild tertian is found; and, finally, in Mompox, the hæmatozoon at a certain time of the year acquires an extreme virulence, the patient sometimes dying during the rigor.

Elephantiasis.—Up to date *Filaria bancrofti* has been found only in Cartagena, where elephantiasis of the scrotum (potra) is also seen.

Trypanosomiasis.—In Tolima, Cauca, and Los Llanos horses and mules are decimated by a disease called "Renguera," the symptoms of which are paralysis of the hinder parts. The disease is due to a trypanosoma.

Esplenomegalia tropical (Tropical Splenomegaly).—A disease the clinical manifestations of which are exactly the same as those of kala-azar occurs, but Leishman-Donovan bodies have not yet been found.

Fiebre hæmoglobinurica (Black-water Fever).—This complaint is observed amongst those attacked by chronic malaria, in which cases the hæmatozoon found in the blood disappears at the outset of the disease, reappearing later on. In many cases quinine is not taken when the disease commences.

Beriberi.—This disease predominates on the Pacific Coast. The rice theory is not believed in, as this food is not used in some of the places where the cases appear.

Disenteria (Dysentery).—In the hot districts chronic dysentery (amœbic) is daily observed, often followed by hepatic abscesses in many of the cases. The bacillary form is extremely toxic and the patients die within a week with septicæmic or peritoneal symptoms. Shiga's serum applied in large doses (90 c.c.) sometimes gives splendid results.

Tun-tun (Ankylostomiasis).—No doubt this is one of the diseases which occurs most in our country, with the exception of the mountainous districts, where the temperature only reaches 16° C. It is common on the sugar and coffee estates, where 95 per cent. of the inhabitants are infested with the parasite.

Both *Ankylostoma duodenale* and *Necator americanus* are found, the latter predominating. Generally speaking, the *ankylostome* is found in people from the centre of the country and the *necator* in those from the seaside or Los Llanos.

The beginning of the disease is the *water itch* (sabañon), followed by progressive anæmia and gastro-intestinal disturbances. The number of red corpuscles per cubic millimetre and the amount of hæmoglobin are reduced enormously. The leucocytes are usually not increased per cubic millimetre, but the eosinophiles and large mononuclears are always relatively increased. The gastric juice is much reduced in acidity. An increase of the urea in the urine is always observed, and sometimes there are traces of urobilin and albumin.

According to the predominating symptoms, *Tun-tun* is divided into the following forms: Œdematous or *beriberic*, dysenteric, diarrhœic, dyspeptic, renal, icteric, and febrile; the last is sub-divided into regular, irregular, and continued.

The drug which has given best results is thymol, with a dose of 4 grm., repeated four or five times. In nearly all mules and horses from the hot districts of the country an ankylostomum is found which weakens the animal considerably.

Trichocephaliasis.—The presence of the *Trichocephalus dispar*, when in great numbers, produces anæmia and intestinal symptoms analogous to those

* *Argas persicus* probably is meant.—Ed.

produced by the ankylostomum. The lacteous juice of Higueron (*Ficus glabra*) in a dose of 40 c.c. gives most wonderful results in expelling these worms.

Schistosomum hæmatobium, Echinococcus granulosus, Bothriocephalus latus.—Lesions originated by these parasites are unknown, but *Ascaris lumbricoides, Oxyuris vermicularis, Tænia solium,* and *T. saginata* are very frequent.

Ceguera (Purulent Ophthalmia).—A purulent and contagious ophthalmia appears in some regions in the Tolima, and is so virulent that it frequently produces complete blindness. The appearance of this disease coincides with the presence of a very small mosquito, which mechanically transmits the disease by its contact with the conjunctivæ. Cuellar describes a coccus as the agent of ceguera.

Piedra de Colombia.—It fell to the lot of Nicolas Osario to discover a hair disease localized in the east of Boyacá, known as Piedra, characterized by one or more small hard lumps, like pieces of stone in the hair, and more frequently in the moustache and beard.

Chichismo (Josue Gómez's Disease).—In some places in the cold climate (16° C.) the lower classes have an alcoholic drink called chicha, prepared in the following manner. Indian corn (maize), after being roughly ground, is left to ferment for some days in a warm place. It is then boiled from six to eight hours, and, after being strained, is mixed with molasses and water. This liquid must ferment for three days before use. As the quantity of alcohol in it is very small, people drink from two to three litres a day.

The intoxication by chicha is very slow and the first symptoms appear after a year of its daily use. This is evidenced by erythema, localized in those parts of the body which have been exposed to the sunshine. Later on the intellectual capacities become stupefied, the knee-jerk is lost, the joints stiffen by contraction and walking becomes difficult and characteristic. The skin hypertrophies, loses all sensibility, and a persistent diarrhœa weakens the patient, who at lasts shows signs of mental weakness and dies. The disease is said only to be contracted by the chicha drinkers, although in Colombia a great quantity of Indian corn (maize) is eaten.*

A NOTE ON BRONCHO-OIDIOSIS.

By Aldo Castellani, M.D.

Director, Government Clinic for Tropical Diseases, Colombo, Ceylon.

Since 1905 I have called attention in various publications to the great frequency in the Tropics of certain types of bronchitis and broncho-alveolitis due to fungi. In Ceylon the commonest type, as I have stated in previous papers, is broncho-oidiosis, called also broncho-endomycosis, bronchomoniliasis, or bronchoblastomycosis. It may be, perhaps, of interest to place on record a further case of this condition; a patient who suffered from it in Ceylon and who had another attack recently in England.

The patient, Mr. S., a planter, aged 40, has resided in low-lying districts of Ceylon for the last fifteen years. At present he has been in Europe since October, 1912. In Ceylon he had always enjoyed good health except for occasional mild attacks of malaria, until the beginning of 1911, when he began complaining of a severe cough, not yielding to the usual treatment. He came to Colombo and consulted me in June of the same year. His general condition was fairly good, but he had a severe cough.

The physical examination did not reveal anything abnormal except a few coarse râles on auscultation. The sputum was muco-purulent, no blood present; it was examined microscopically several times. In fresh preparations round and oval yeast-like bodies were present similar to those I had seen in so many other cases previously. Several tubes of maltose agar were inoculated and the fungus *Monilia tropicalis*, described by me some years ago, was grown. The examination of the sputum for tubercle bacilli, repeated four times, was negative, and its inoculation into two guinea-pigs gave negative results.

I prescribed saiodin as usual, and the patient went back to his estate. He wrote to me some time later stating that within two weeks all the symptoms had nearly disappeared, but a slight cough, with mucous expectoration, remained. In October, 1912, the patient came to London, and in the beginning of December he came to consult me, stating that the old symptoms had reappeared following on a very slight ordinary "cold." The physical examination of the chest revealed nothing at all. The expectoration was muco-purulent without blood. Large numbers of yeast-like or spore-like bodies with double contour were present in the sputum. T.B. negative. I put him again on saiodin 15 gr., three times daily; all the symptoms disappeared within ten days, but once or twice a day he would have a slight attack of cough, with a little mucus in which the fungus, though scarce, was still present. He left for the Continent in January, 1913. I have recently heard from him to the effect that the cough has quite ceased and that he is in the best of health.

Remarks.—A few general remarks on broncho-oidiosis and other diseases of the respiratory organs due to fungi, may not be out of place. In Ceylon these affections—which come under the general term of bronchomycosis—may be classified as follows:—

(1) Bronchitis and broncho-alveolitis due to fungi of the genera *Monilia, Saccharomyces,* and *Cryptococcus.*

(2) Broncho-alveolitis due to fungi of the genus *Nocardia.*

(3) Broncho-alveolitis due to fungi of the genera *Mucor, Rhizomucor,* and *Lichthemia.*

(4) Broncho-alveolitis due to fungi of the genera *Aspergillus, Sterigmatocystis,* and *Penicillium.*

* This is evidently Pellagra.—Ed.

(5) Broncho-alveolitis due to undetermined fungi. The symptoms are somewhat similar whatever fungus is the etiological factor; in mild cases there are signs of slight bronchitis with muco-purulent expectoration, in which the fungi are found. In severe cases the patient presents all the symptoms of phthisis with hectic fever and hæmorrhagic expectoration.

Mild cases may become cured spontaneously, they are often benefited by potassium iodide. I have, in Ceylon, observed and described cases of Southern India and the Malay States, and it would appear that the fungus is the real cause of the disease, as no other etiological agents, such as tubercle bacillus, &c., are found. Moreover, when the patient gets better the fungus becomes very scanty or disappears completely. In some cases I have observed other species of the fungus, but I doubt whether all these are really pathogenic.

These species are *Monilia paratropicalis*, Cast.; *M. pinoyi*, Cast.; *M. guillermondi*, Cast.; *M. negrii*, Cast.; *M. nivea*, Cast.; *M. candida*, Cast.; *M.*

FUNGI OF THE GENUS MONILIA FOUND IN CASES OF BRONCHO-OIDIOSIS.

	Litmus milk	Glucose	Lævulose	Maltose	Galactose	Saccharose	Lactose	Mannite	Dulcite	Dextrine	Raffinose	Arabinose	Adonite	Inulin	Sorbite	Broth	Peptone water	Indol	Gram	Gelatine	Serum	Neutral red
Monilia albicans, Robin.	AC	AG	AGs	AGs	AG	Avs	O	O	O	O	O	O	O	O	O	CTP	C	O	+	+	+s	O
Monilia bronchialis, Cast. ...	O	AG	AG	AG	O	AGs	O	O	O	A	O	O	O	O	O	C	C	O	+	O	O	O
Monilia guillermondi, Cast. ...	O / Alk	AG	AG	As	A	AG	O	O	O	O	AGs	O	O	O	O	CTP	C	O	+	O	O	O
Monilia insolita, Cast.	As / Alk	AG	AG	AG	AG	AG	O	As	O	O	O	O	O	O	O	C	C	O	+	O	OB	O
Monilia krusei, Cast.	O	AG	AG	O	O	O	O	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O
Monilia negrii, Cast.	Avs / Alk	AG	AG	As	AGs	AG	O	O	O	O	AGs	O	O	O	O	C	C	O	+	O	O	O
Monilia nivea, Cast.	O / Alk	AG	AG	AG	AG	AGs	O	O	O	O	AG	O	O	O	O	C	C	O	+	O	O	O
Monilia nitida, Cast.	A / DC	AG	AG	A	A	A	A	A	O	Avs	As or O	O	O	O	O	CTP	C	O	+	O	O	O
Monilia paratropicalis, Cast. ...	As / Alk	AG	AG	AG	AG	AG	O	O	O	Avs	O	O	O	O	O	CTP	C	O	+	O	O	O
Monilia pseudotropicalis, Cast. ...	ACs	AG	AG	O	AGs	AG	AG	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O
Monilia pinoyi, Cast.	O	AG	AG	AG	O	O	O	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O
Monilia pulmonalis, Cast. ...	O / Alk D	AG	AG	AG	AGs	AG	O	Avs	O	O	A	AGs	O	O	O	CTF	C	O	+	O	OB	O
Monilia rotunda, Cast.	AC	A	A	A	A	O	A	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O
Monilia rugosa, Cast.	A / PsCs	As	As	As	As	As	O	O	O	O	O	O	O	O	O	C	C	O	+	O	O	O
Monilia tropicalis, Cast. 1909 ...	A	AG	AG	AG	AGs	AGs	O	O	O	O	O	O	O	O	O	C	C	O	+	O	OB	O
Monilia zeylanica, Cast.	ACs	A	A	A	A	A	As	O	O	A	Avs Gvs	O	O	Avs	O	C	C	O	+	O	O	O

Abbreviations used in the table:—

A—acid; G—gas; C—clot (milk), clear (broth and peptone water) CTP—clear at first, then thin pellicle present. D—decolorized. P—peptonized (milk), pellicle (broth). Alk—alkaline. $\frac{A}{Alk}$—acid, then alkaline. s—slight; vs—very slight. B—brown pigmentation of the medium. O—negative result, viz., neither acid nor clot in milk; neither acid nor gas in sugar media; non-production of indol; non-liquefaction of gelatine or serum, as the case may be. +—positive result, liquefaction of medium.

all five groups mentioned, but a more detailed account may be given, perhaps, of the condition due to fungi of the genus *Monilia* (*oidium*, *endomyces*, *saccharomyces*), which is by far the commonest type found in Ceylon, and from which the case I have reported suffered. In Ceylon, according to my researches, the malady is generally due to *Monilia tropicalis*, described by me. I have found the same fungus in cases coming from *insolita*, Cast.; *M. pseudotropicalis*, Cast.; *M. lacticolor*, Cast.; *M. nitida*, Cast.; *M. candidans*, Robin; *M. lactea*, Cast.; *Monilia* (?) *krusei*, Cast.; *Monilia* (?) *rugosa*, Cast.

The infection may take place from man to man, and also most probably by the fungi living saprophytically in nature. Monilia-like fungi are extremely common in Ceylon, in tea-dust, for instance, and it is very probable that the so-called

"tea-factory cough" is a type of moniliasis, as in such cases a monilia is found in the sputum, and monilia-like fungi are constantly found in the factory tea-dust. Moreover, guinea-pigs, into the nostrils of which tea-dust is regularly insufflated, develop after a time a moniliasis of the lungs.

Symptomatology.—A mild and a severe type of the malady may be distinguished. In the mild type the general condition of the patient is fairly good, there is no fever, and he simply complains of cough. The expectoration is muco-purulent and very often scanty; no blood. The physical examination of the chest will reveal a few coarse moist râles, or absolutely nothing. The condition may last several weeks or months, and may get cured spontaneously, or, continuing, may turn into the severe type.

The *severe* type closely resembles phthisis: the patient becomes emaciated, there is hectic fever, muco-purulent and bloody expectoration. Occasionally true hæmophthisis occurs, a teaspoonful or more of bright blood being spat up at a time. The physical examination of the chest shows patches of dulness, fine crepitations and pleural rubbing. This type is often fatal. Between these two extreme types there are cases of intermediate severity, with subcontinued and continued fever, with more or less definite bronchial and broncho-alveolar symptoms.

Prognosis.—The cases of a mild type may recover spontaneously or under appropriate treatment. Those of the malignant type usually end fatally.

Diagnosis.—The diagnosis of moniliasis is based on finding the fungus in the sputum. It is absolutely necessary that this should be collected in sterile Petri dishes and examined as soon as possible, as sputum exposed to the air becomes contaminated with all sorts of fungi in the Tropics.

In fresh preparations of the expectoration, spore-like, roundish, or oval cells, 4 to 6 microns, with often a double contour, are seen, and occasionally some mycelial elements. The fungus is Gram positive.

To identify the fungus cultural methods are necessary. A particle of the sputum is smeared on maltose or glucose agar plates; after two or three days, white, rather large, roundish colonies appear, easily distinguishable, even macroscopically, with a little practice, from the colonies of cocci, &c. The fungus colonies are further investigated by inoculating maltose agar, ordinary agar, gelatine, serum, and a series of sugar broths. All the species of monilia (oidium) found in my cases grow well on ordinary agar, but much more abundantly on maltose and glucose agar, especially if slightly acid. On these media the growth—which is generally white with a smooth surface when young, slightly crinkled when old—is composed practically of globular yeast-like cells, while in the water of condensation globular cells and particles are found together. A little mycelium may, however, be found also occasionally in the growth on the slope. On serum all the strains produce at first a white growth, but some later on induce a peculiar brownish black discoloration of the medium round the growth. Most species do not liquefy the medium.

On gelatine all the species grow fairly well; a few, including *Monilia candidans*, produce liquefaction of this medium. In milk some do not produce either acid or clot, others induce a temporary or permanent acidity, others clot the milk or peptonize it. The reactions of the various sugar broths are important, and in association with the action of the fungi on serum, gelatine, and milk yield the data on which the differentiation of the various species is made.

Differential Diagnosis.—Primary bronchomoniliasis, as described in this paper, should be distinguished from the secondary bronchomoniliasis occasionally met with in cachectic patients suffering from cancer, diabetes, tuberculosis, &c. In such cases there is generally thrush of the oral mucosa, and the thrush monilia spreads to the pharynx, larynx, and bronchial mucosa, while in primary bronchomoniliasis the oral mucosa is not, as a rule, affected.

From pulmonary tuberculosis the condition is distinguished by the absence of the tubercle bacillus in the sputum and the negative animal inoculations. Cases of mixed infection, however, tuberculosis and moniliasis, are occasionally met with, the sputum containing both the tubercle bacillus and the monilia fungus. Moniliasis differs from bronchospirochætosis by the absence of spirochætes, and from endemic hæmoptysis by the absence of the ova of *Paragonimus westermani*, Kerbert.

Treatment.—Mild cases and those of medium gravity respond quickly to potassium iodide (10 to 20 gr.), given well diluted in water or milk, three times daily. When potassium iodide causes severe symptoms of iodism, saiodin in the same dosage (in cachets) may be administered. In the cases of malignant type I have seen no improvement from the many different treatments tried. Potassium iodide, however, should always be tried in these cases as well as balsamics. The diet should be nourishing; with hypophosphates and glycerophosphates, &c., as tonics.

REFERENCES.

CASTELLANI: *British Medical Journal*, 1910 and 1912; *Lancet*, 1911; *Philippine Journal of Science*, 1910; Ceylon Medical Reports, 1905 1911.

"Bulletin de la Société Médico-Chirurgicale de L'Indochine," Tome iv, Février, 1913, No. 2.

Appendicostomy for Dysentery.—Le Roy des Barres reports a successful case of appendicostomy for chronic dysentery. He specially reports the case because in his experience operations of this sort, either done by himself, or seen by him, have not given satisfactory results. He points out the importance of doing the operation early, and not waiting till the patient is *in extremis*. At first permanganate $\frac{1}{1000}$ was used to wash out the bowel, and the patient also took in addition a disinfectant powder composed of phosphate of bismuth and charcoal. The number of stools rapidly diminished, and when the fistula closed spontaneously they were solid and naturally formed, the general health of the patient also being very good.

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THE JOURNAL OF

Tropical Medicine and Hygiene

APRIL 1, 1913.

THE DIFFICULTIES OF THE MILK SUPPLY IN TROPICAL COUNTRIES.

WHEREVER Europeans, especially English-speaking folk, dwell in tropical countries the question of the milk supply is an ever-present anxiety. Without a supply of fresh cows' milk the doctor is handicapped in the treatment of disease, and parents are harassed to know how to supply the deficiency for their children's wants. The several animals from which the milk possible for human consumption may be derived are the imported and native cow, the buffalo, the mare, the ass, and the goat. Of these cows' milk is always preferred, and the milk of cows imported from Europe, Australia, or America, whenever it can be had, is chosen to the exclusion of that from the native cow. Chemical analysis shows why cows' milk is selected, and there are several reasons why the milk of the imported cows has the preference. The establishment of a local dairy of European, American, or Australian cows is, and will continue to be, a question largely of expense. To bring cows, say, from the western shores of the United States of America to the eastern coast of Asia, from Singapore to Japan, is fraught with anxieties to the importer, for there are the dangers of the long voyage across the Pacific to be thought of, the difficulty of acclimatization to be considered, and the chances of the imported cows contracting disease from native cattle. There is also the possibility of the imported stock proving useless, either on account of the age of the cattle sent by unscrupulous vendors, or owing to changes in the climate, food, and surroundings affecting the flow of milk.

The distance which these animals have to travel increases the price to the importer to well-nigh double their original cost, so that with the prospect of accidents during transportation and subsequent disease there are sufficient reasons to cause importers to hesitate before embarking upon a venture which is fraught with difficulties and all too often financial loss. It comes about, therefore, that the establishment of a dairy of imported (that is, European or American) cows resolves itself more or less into a philanthropic undertaking, at any rate in the first instance, and is usually undertaken by some of the more thoughtful and public spirited members of the community combining to form a company. The local Government ought to do so in the interests of the public health, but we have not reached that higher stage of practical science in public health matters in many parts of our Empire as yet. The advantages of an "imported cow" dairy are several; the milk is usually of a better quality, the dairy is generally in charge of, or at any rate under the supervision of, a European, so that greater cleanliness is likely to be, and is, taken in all matters appertaining to the cows themselves, the milking, the storing, and the distribution of the milk and the making of butter. These factors, quality and cleanliness, are of primary importance when dealing with dairy produce. The quality of a cow's milk largely depends on the food supplied her. The fine English meadow land is unique; it is green practically all the year round; it is the product of scores, sometimes hundreds, of years of land undisturbed by the plough, and it affords a quality of grass and hay, and consequently of milk (and of beef or mutton) unequalled in their wholesomeness and nourishing qualities. To transfer a cow from pastures of this kind to a tropical country where the "grass cutter" finds the green food, where the dry food consists of straw or hay rapidly ripened and dried to a cinder almost under a hot sun, and wanting that "sappiness" so essential for milch cows, with turnips and mangolds out of the question as articles of food, it comes to merely getting sufficient food to just keep the animal alive somehow with the available material to hand. The milk suffers thereby in quality, and yet it is calculated to be superior to that of the native cows in the neighbourhood; for they are given no imported supplementary food, but are turned out to find a living on bare and burnt patches where unwholesome weeds may spring up, but where, except for it may be some few weeks during the wet weather,

nothing approaching grass is seen. Milk analysis has reached as near perfection as the chemist can attain, and yet the essential "goodness" of milk it is beyond the chemist to state. Milk is like no other element of our food; it is the only product, except raw eggs, of a living animal used by man; all other articles of food are not only taken from animals that have been killed, but the meat derived therefrom is cooked before it is eaten. Milk, being an animal secretion, varies directly with the food, the water, the health, and the breed of cattle, so that there is no finite analysis of milk possible, and it is this "living" factor of milk, combined with the idiosyncrasy of, say, individual children that causes milk from the same cow or dairy to disagree with one or more members of a family, while it suits others of the same household. The quantity of cream present in a specimen of milk, although the popular test, is wholly misleading. The milk of the buffalo cow shows some 17 per cent. of cream, whereas "good" cows' milk yields but about 10 per cent.; yet is buffalo cream difficult to digest, whilst the skimmed milk is of a low nutritive value compared with the skimmed (not separated) milk of dairy cows.

Many tropical residents, especially in the more northern parts of India, where more green food is obtainable than elsewhere in that country, keep their own cows, which are usually of the native breed of cattle, and pride themselves on their supply of milk. When they contract intestinal troubles and have to come home in consequence, and when treatment by milk is suggested, the answer not infrequently is: "Oh! I tried milk in India (or elsewhere), and it did no good." When asked if the milk was good, the answer may be: "Oh, yes; we kept our own cows." From the above discussion it will be gathered that milk in the Tropics or sub-Tropics, even when "our own cow's," is not of the quality of English milk, and that because milk did not do good abroad, it is no criterion that milk from cows fed on English pastures will not have a beneficial effect.

The argument in favour of foreign versus native cow's milk may be pushed even further; for residents in Burma, for instance, where Australian cows are imported to some extent, find that children given the milk of native cows may not thrive, whereas when they are put on to milk from imported Australian cows their health improves immediately. The explanation of this observation is that the quality of milk varies with the breed; for the cows, native and imported, in several dairies kept by residents in Burma are herded together and fed alike.

Is it possible to maintain and acclimatize a breed of cattle in the Tropics imported, say, from Europe, so that they will go on reproducing their kind satisfactorily? The answer is yes and no! Young bulls must be imported every year or two if the breed is to be maintained; it is not possible to prevent the herd degenerating without this even in the Argentine, the most favoured place, outside the British Isles, for the rearing of cattle. The farmers there have to import fresh blood from Britain at frequent intervals.

This difficulty of rearing British cattle in the same perfection as at home, for either milk or calf-producing, cannot seemingly be overcome; for as the climate of Lancashire favours the quality of cotton manufactured, so the quality of the food and climate of the British Isles enhances the quality of the cattle reared within its shores to an extent which is recognized throughout the world.

J. C.

Annotations.

The Blood-plates in Tropical Anæmia.—In the *Proceedings* of the Canal Zone Medical Association for the half-year, April to September, 1911, is a paper by Darling on "The Blood Platelets in Tropical and Other Forms of Anæmia." He follows Wright in believing that the blood-plates are detached portions of the cytoplasm of certain large marrow cells, called by Howell megalokaryocytes. His observations have led him to the belief that the platelets are diminished in number in certain diseases, such as malaria, hæmoglobinuric fever, uncinariasis, verruga peruviana, relapsing fever, kala-azar and typhoid fever at certain phases of the disease; they are also diminished in number in Addisonian anæmia, lymphatic leukæmia, and purpura hæmorrhagica.

On the other hand, the platelets are increased in number in myelogenous leukæmia and in myeloid neoplasms, such as Hodgkin's disease. This suggests that the giant cells described by Reed and others in Hodgkin's disease are megalokaryocytes and that Hodgkin's disease is a myelomatosis of certain lymphoid elements; as a diagnostic corollary, the clinical separation of true Hodgkin's disease from lympho-sarcoma follows when the latter does not contain megalokaryocytes.

The size and staining characters of the platelets are sometimes altered, this being analogous to such changes in the erythrocytes as microcytosis, poikilocytosis, macrocytosis and polychromasia.

It is believed that if the changes in numbers and morphology to which the platelets are subject in various diseases will be observed more carefully, they will furnish material help in the diagnosis of diseases affecting the blood-forming organs.

Sunstroke.—At the sixty-fourth meeting of the Canal Zone Medical Association (Isthmian Canal Commission), July 12, 1911,* Crabtree reported two cases of sunstroke occurring on the Isthmus of Panama. He states that the classification found

* *Proceedings* of the Canal Zone Medical Association, Isthmian Canal Commission, for the half-year, April to September, 1911. Vol. iv., part 1. I.C.C. Press, Quartermaster's Department, Mount Hope, Canal Zone.

in most American text-books of the diseases produced by the sun's rays and high atmospheric temperature is as follows:—

(1) *Sunstroke.*—The description of which may be thus epitomized: Headache and giddiness coming on while exposed to the sun's rays, in very hot weather, soon followed by coma, hot dry skin, flushed face, rapid, bounding pulse, high fever—from 106° to 112° F.—deep, laboured and stertorous breathing; and, in some cases, involuntary evacuations and epileptiform convulsions. The severer the case the more likely are the latter to occur. Alcoholism is a predisposing factor, very frequently, in fact.

(2) *Heat Exhaustion.*—This may result whether exposed to the sun's rays or not, if the temperature is high with humidity. More frequently it occurs indoors. Skin cool and livid, rather than red as in sunstroke; bodily temperature often subnormal, pulse rapid and weak, and breathing rapid but not laboured. (In other words, symptoms of collapse.) Restlessness, anxiety, and sometimes delirium are noted, but the sensorium is practically normal in most cases.

These two conditions are almost diametrically opposite in symptoms, and treatment required.

Both the cases described by the author gave histories typical of sunstroke. One case recovered, but though regaining his strength was never quite clear mentally, and had to be invalided home after several months' observation in hospital. The other case died, and the autopsy bore out the clinical diagnosis.

Notes and News.

The House-fly as a Danger to Health.—The British Museum (Natural History) Economic Series, No. 1, bring out a pamphlet on "The house-fly as a danger to health, its life history, and how to deal with it." The pamphlet has been prepared by Mr. E. E. Austen, of the Entomological Department of the British Museum, the well-known authority on flies. Such information is urgently required by the laity because of the numbers of these insects during the summer months in parts of London. In many instances they are a veritable pest, and now that it is known that they are also active disseminators of disease, it is high time that steps were taken to limit their numbers by abolishing or destroying their breeding grounds.

To those ignorant of the life history of the common house-fly the pamphlet will give all the necessary information, and the illustrations found throughout its pages will make all the points quite clear. It would be well if it were widely distributed throughout schools and other teaching centres, so that the youth of the present day might grow up possessing information upon which they could act later in life. It is by getting at the young that the best results in elementary sanitation will be attained.

Abstract.

Studies on Pneumonic Plague.

Influence of Atmospheric Temperature upon the Spread of Pneumonic Plague.

(*Continued from p.* 93.)

In Manchuria, during the winter of 1910 to 1911, pneumonic plague spread with such rapidity that within three months 50,000 people died of the disease. Except toward the close of the epidemic, sanitary conditions were bad, the weather was bitterly cold, and quarantine measures were inadequately enforced. In India, where sanitary conditions are, perhaps, equally as bad, although there have been numerous isolated cases of pneumonic plague during the past fifteen years (from 2 to 5 per cent. of all plague cases), this type of the disease has not assumed epidemic proportions.

Why was there a rapid spread of the pneumonic type of the disease in the one instance and a failure to spread in the other? The most obvious difference in the two instances is one of temperature, in the one case as low as 30° C. below zero as compared to 30° C. above zero in the other. Can the failure of pneumonic plague to spread in India be due to the high temperature that prevails in this country? If one considers only the direct action of the high temperature upon the plague bacilli, this question must be answered in the negative; for the optimum temperature for the cultivation of the plague bacilli upon artificial media is 30° C., which is approximately the temperature to which they would be subjected in India. Teague and Barber,* however, believe that indirectly the temperature of the atmosphere is a factor of vast importance in the spread or failure to spread of pneumonic plague.

It is quite generally accepted that infection in pneumonic plague is due to the inhalation of plague bacilli and, as plague bacilli are readily killed by drying, it is fair to assume that infection is due to the inhalation of moist bacilli—the so-called "droplet infection." In plague pneumonia, the mucous membranes of the bronchi, trachea, larynx, and mouth are covered with enormous numbers of plague bacilli. It follows that such a patient in coughing throws out droplets of sputum which must contain plague bacilli. Strong and Teague demonstrated that this does, in fact, occur. Petri dishes, containing solidified agar culture medium, were held before the mouths of coughing plague patients, and, even when no visible particles of sputum appeared, colonies of plague bacilli developed on the plates. Granted that infection is due to the inhalation of droplets of sputum containing plague bacilli, it follows that the longer these droplets remain suspended in the air, the greater the danger of infection.

* *Philippine Journal of Science*, Section B, vol. vii, No. 3, June, 1912.

These droplets may disappear from the air in the immediate neighbourhood of the patient in three ways, namely (1) by evaporation, (2) by settling, and (3) by being borne away by currents of air.

The rate of evaporation depends chiefly upon the water deficit of the atmosphere. Under ordinary conditions this is far greater in warm weather than in cold, and hence, ordinarily, evaporation of droplets of moisture in the air will take place far more rapidly in warm weather than in cold. At 40° C., with a maximum of moisture in the air, the water vapour has a pressure of only 6.0 millimetres of mercury; hence, even if the atmosphere were absolutely dry at this temperature, the water deficit would be small and evaporation would take place very slowly.

At 30° C., with a maximum of moisture in the air, the pressure of the water vapour amounts to 31.5 mm. With 70 per cent. of moisture in the air, there would still be a greater water deficit (9.4 mm. of mercury) than in a perfectly dry atmosphere at 4° C. In a cold climate, with snow on the ground and a rise of several degrees in temperature during the middle of the day, the water deficit of the air would be approximately zero during the greater part of the twenty-four hours. These were the conditions in Manchuria during the recent epidemic of pneumonic plague; hence there must have existed a very low water deficit in the air and little tendency for the droplets of sputum to disappear by evaporation. In India, on the contrary, with a temperature ranging around 30° C., there is usually a large water deficit in the air and hence the droplets of sputum would tend to disappear quickly by evaporation, thus leading to the death of the contained plague bacilli by drying.

According to curves given in the Report of the International Plague Conference, the temperature at Harbin during the course of the epidemic ranged between —9° C. and —32° C. and the humidity between 61 and 92. At —10° C., the vapour tension of water is 2.09 mm. of mercury and at —20° C., it is 0.92 mm. Hence, with an average humidity of about 80, the water deficit of the air at Harbin during the epidemic would be represented by from 0.4 to 0.2 mm. of mercury. Under these circumstances, evaporation could take place only with extreme slowness.

In India, with a temperature of +30° C. and a humidity of 70, the water deficit of the air would be represented by 9.46 mm. of mercury. In other words, evaporation would take place from twenty-five to fifty times more rapidly in India than in Harbin.

During the plague epidemics of both India and Manchuria, the fact that the poor people were much overcrowded in their living quarters undoubtedly hastened the spread of the disease. In Manchuria, on account of the bitterly cold weather, the doors and windows of the overcrowded houses were kept tightly closed. Under these circumstances, another factor is introduced of perhaps no small importance in its bearing upon the rate of disappearance by evaporation of droplets of sputum in the air; namely, the moisture in the expired air. In the cold, the moisture from the breath of the inmates of an overcrowded room would quickly saturate the air and reduce evaporation to a minimum, whereas the air of a similar warm room could take up large quantities of moisture without becoming saturated.

The surface tension of water at 4° C. is 74.9, and at 30° C. it is 71.03. The surface tension being greater at the lower temperature, with the same amount of water deficit, evaporation would take place more slowly there than at the higher temperature. This is, therefore, an additional factor which would tend to cause droplets of pneumonic sputum to persist longer in the air in a cold climate than in a warm one. However, it is a factor of far less influence than the water deficit of the air and hence deserves no further discussion.

It seems highly probable that plague bacilli in suspended droplets of sputum would survive much longer at a low temperature than at a high one, even were the water deficit of the air the same in both cases; or, in other words, that with the same rate of drying, the bacilli would remain alive longer at low temperatures than at higher ones. This would, then, be also an important factor in causing pneumonic plague to spread more rapidly in cold climates than in warm ones.

It is noteworthy that the only large epidemic of pneumonic plague in India, of which we have a record, occurred during cold weather in Kashmir in the winter of 1903 to 1904. The epidemic is described by A. Mitra, who stated that it lasted from November, 1903, to August, 1904, "but the virulence was only from December to March." In the districts there were altogether 1,443 cases with twenty recoveries; the recoveries being bubonic cases, which were seen at the end of the epidemic. We judge from these statements that the epidemic of pneumonic plague lasted from December till March. Mitra says:—

"The conditions of life in these villages during the months of January and February were extremely unfavourable. Everything round was frozen."

The *Indian Weather Review* shows that Srinagar, which was the centre of the Kashmir epidemic, had, during the month of December, 1903, a mean daily temperature of 36.1° F. and a mean humidity of 81.0°; during January, 1904, a mean daily temperature of 29.1° F. and a mean humidity of 88.0°; during February, 1904, a mean daily temperature of 36.0° F. and a mean humidity of 85.0°.

Therefore the conditions were such that droplets of sputum suspended in the air would have had a tendency to evaporate to dryness only with extreme slowness.

Gill appears to have been the only investigator who has devoted especial attention to the epidemiology of pneumonic plague in India.

That plague bacilli may be unable "to long maintain their unusual or perhaps exalted degree of virulence" by passage from lung to lung, as is suggested by Gill, appears to us to be highly im-

probable, since the experimental data at hand indicate that passage from lung to lung in susceptible animals is the method of choice and, perhaps, the only method of exalting the virulence of plague bacilli and maintaining the high virulence thus attained.

The epidemiological observations of Gill possess, however, great interest with regard to the influence of atmospheric temperature upon the spread of pneumonic plague. He found that pneumonic plague occurred during cold weather and ceased when the warm weather began, in spite of the fact that the number of bubonic cases was still on the increase. Unfortunately, he did not publish his notes in sufficient detail to allow of determination of the atmospheric temperature and humidity which existed during his several epidemics, but as far as his observations go, they indicate that the atmospheric temperature was probably a factor of importance in the spread of pneumonic plague and the suppression of the epidemic.

The only other epidemic of pneumonic plague of recent years, of which we find a reliable record, is the small one which occurred in Osaka, Japan, also in the cold season of the year. The first patient was taken sick on December 19, 1899. This case was quickly followed by twelve others, the last dying on January 13, 1900.

The above discussion has been confined entirely to pneumonic plague, but obviously the same ideas apply also to other pneumonias. In other pneumonias, however, it is not unlikely that the dosage and virulence of the inhaled bacilli and the susceptibility of the host at the time of exposure are factors of far greater importance than in plague pneumonia; hence, the influence of atmospheric temperature on their spread would be more or less obscured by these other factors.

Teague and Barber endeavoured to obtain experimental data confirmatory of the ideas advanced in the foregoing discussion. It was, of course, impracticable to perform actual experiments with plague bacilli sprayed into the air on account of the danger of contracting pneumonic plague. They, therefore, sprayed harmless bacteria and determined how they behave in the air under different conditions, believing that the results obtained would justify them in drawing conclusions as to how plague bacilli would act under similar conditions. They selected for most of the experiments *B. prodigiosus* and a yellow sarcina obtained from the air. Those organisms possess the following advantages for these experiments: (1) They are harmless; (2) their colonies on agar are readily recognized on account of the characteristic pigment production; and (3) they differ considerably in their resistance to death by drying, the *B. prodigiosus* being killed more readily than the sarcina. In a few experiments the cholera vibrio was used; this organism is much more readily killed by drying than is *B. prodigiosus*.

The authors found by experiment that the plague bacillus occupies an intermediate position between cholera and *B. prodigiosus* with regard to its resistance to death from drying. Sarcina is much more resistant than the other organisms.

Having determined the relative resistance to death by drying of sarcina, *B. prodigiosus*, and cholera vibrio when spread in a thin layer upon glass slides, they next planned an experiment to find the result with these same organisms when contained in fine droplets of saline solution suspended in the air.

It was found that when sprayed into the air under similar conditions, living cholera vibrios disappear from the air in about six minutes and living *B. prodigiosus* in about twenty minutes, whereas sarcina remains alive for more than three hours. There is a striking similarity shown by these organisms in their relative resistance to drying on glass slides and their persistence in the air when contained within fine droplets of saline solution. It would seem, therefore, that had plague bacilli been sprayed under similar conditions, the living ones would have disappeared from the air between six and twenty minutes after spraying.

This similarity in the behaviour of the organisms on the slides and in droplets strongly suggests that also in the latter instance the disappearance of the living bacilli from the air is due to death from drying. If this were true, then if one were able to retard the evaporation of the water of the fine droplets, the living bacteria should remain in the air for a longer time. The most obvious method of retarding the evaporation of the fine droplets is to spray them into an atmosphere saturated with moisture. Such an experiment was therefore carried out.

In the dry hood the living cholera vibrios had all disappeared from the air six minutes after the spraying was discontinued, whereas in the wet hood living cholera vibrios were present after twenty-seven minutes. The wet and dry bulb thermometers showed that the air of the wet hood was nearly saturated with moisture, and hence evaporation of suspended droplets of water must have been reduced almost to the minimum. Therefore, one is justified in concluding that the extremely rapid disappearance of the living cholera vibrios in the dry hood is due to the rapid evaporation of the suspended droplets of saline solution which leads to the death of the contained cholera vibrios from drying.

The last part of the experiment shows conclusively that the rapid disappearance of living cholera vibrios is not due to settling or removal through air currents, for droplets containing cholera vibrios and those containing sarcina were subjected to identical conditions and yet living sarcinæ were present in the air long after the cholera vibrios had disappeared. The sarcina, being a larger organism and having a greater tendency to remain in clumps, would settle out more rapidly than the cholera vibrio. It remained alive in the air longer than the cholera vibrios because of its greater resistance to drying. A similar experiment was performed with *B. prodigiosus*.

As with the cholera vibrios so also in the case of *B. prodigiosus* there is a striking difference in the length of time that the bacilli remain alive in a dry and in a moist atmosphere. In the cold room

the bacilli remain alive in the air even longer than in the wet hood. Unfortunately, the humidity of the cold room during this experiment was not determined.

It was, therefore, necessary to perform the following experiment. The same suspension of *B. prodigiosus* was sprayed for one-half a minute into a moist hood and into a cold storage room, and Petri dishes containing solidified agar were exposed in both places for periods of two minutes each at intervals of four hours. In the cold room the dry bulb thermometer registered 12° C. and the wet-bulb one about 10.5° C. throughout the experiment. In the hood the dry-bulb thermometer varied between 31.1 and 31.5 and the wet-bulb one registered about 0.2° below the dry one. It is clear that the water deficit of the atmosphere was greater in the cold room than in the hood.

In spite of the fact that the water deficit of the air of the cold room was greater than that of the hood, the bacilli remained alive longer in the cold room. The only interpretation of this result is that *B. prodigiosus* resists death from drying longer at low temperatures than at high ones, even when the rate of drying is the same in both instances. It seems highly probable that this is also true of the plague bacillus; if so, the bearing of the phenomenon is an additional factor in the longer persistence of living plague bacilli in droplets of sputum, and hence upon the more rapid spread of pneumonic plague in cold climates is obvious.

Summary.—It is shown that when spread on glass slides and exposed to the air, plague bacilli occupy an intermediate position between the cholera vibrio and *B. prodigiosus* with regard to resistance to death from drying. Sarcina resists much longer than *B. prodigiosus*. When suspended in saline solution and sprayed into the air, the living cholera vibrio disappears with surprising rapidity, *B. prodigiosus* persists for a longer time, and sarcina much longer than *B. prodigiosus*. The relative length of time that these organisms remain alive when sprayed into the air agrees strikingly with their survival on glass slides. This suggests that their disappearance from the air is also due to death from drying.

This was shown to be in fact the case by spraying the same cholera suspension into a comparatively dry atmosphere, and then, under similar conditions, into an atmosphere nearly saturated with moisture; living cholera vibrios remained in the air much longer in the latter instance. A similar experiment was performed with *B. prodigiosus* with the same result.

By spraying sarcina and immediately thereafter cholera vibrios, so that the droplets containing these organisms were subjected to identical conditions, living sarcina was found to persist in the air long after the living cholera vibrios had disappeared. Since the sarcina is a larger organism than the cholera vibrio, it follows that the disappearance of the latter was not due to settling.

They believe they are justified in concluding from these experiments that were the plague organisms sprayed under similar conditions they would persist longer than cholera vibrios, but a shorter time than *B. prodigiosus*. Hence, it seems probable that the plague bacilli contained in fine droplets of pneumonic plague sputum would suffer death from drying in a few minutes unless they were suspended in an atmosphere with an extremely small water deficit. Infection in pneumonic plague follows the inhalation of droplets of pneumonic sputum, and obviously the longer these droplets remain suspended in the air, the greater is the danger of infection. As has just been stated, these fine droplets disappear very quickly except when they are suspended in an atmosphere with a very small water deficit. Such an atmosphere is under ordinary circumstances of common occurrence in very cold climates, whereas it is extremely rare in warm ones. Hence, since the droplets of sputum persist longer, the plague bacilli remain alive longer in the air, and there is a greater tendency for the disease to spread in cold climates than in warm ones.

In harmony with the above ideas, they find that the only great epidemic of pneumonic plague of modern times occurred in Manchuria during the winter of 1910 to 1911, when the atmospheric temperature was many degrees below zero Centigrade. The disease spread with amazing rapidity. Furthermore, although during the past fifteen years there have been millions of plague cases in India, and 2 to 5 per cent. of these have been cases of plague pneumonia, yet this form of the disease has not assumed epidemic proportions. The largest epidemic of pneumonic plague in India (1,400 deaths) occurred in Kashmir in Northern India at an elevation of 1,524 metres above the sea level during very cold weather.

Strong and Teague,* continuing the report on their researches, state that they studied experimentally the question of *the portal of entry of the organism and the method of the development of the lesions in pneumonic plague*. Animals were placed in closed glass cages, and agar cultures of virulent pneumonic strains of the plague bacillus suspended in saline solution were sprayed for a period of from about two to three minutes into the surrounding air which they breathed. Thirty-four normal guinea-pigs and fifty-five normal monkeys were so infected with plague bacilli, and all succumbed to plague infection. The animals were necropsied in each instance, and the lesions present observed and studied. It would be very tedious, say the authors, to record the individual necropsy reports, since the lesions found were so often similar. Therefore, only a general description of the lesions is given, and the different types of lesions emphasized.

In the guinea-pigs so infected, the following changes were encountered at necropsy. In general

* *Philippine Journal of Science*, Section B, vol. vii, No. 3, June, 1912.

there was marked evidence of plague infection about the cervical and laryngeal tissues. The subcutaneous tissues showed extensive œdema, and there was swelling of the cervical lymphatic glands and of those about the trachea. Usually the glands were not only swollen but more or less hæmorrhagic and presented the appearance of small early buboes. Throughout the body marked evidences of septicæmia were usually present. There were frequently extensive hæmorrhages in the intestinal wall. The spleen sometimes showed the typical changes encountered in bubonic plague infection with miliary abscesses. Distinct evidences of pneumonia were present in only about 23 per cent. of the guinea-pigs. Plague bacilli were frequently not very abundant in the lungs, unless pneumonic areas were encountered, but were always present in the heart's blood. The lungs were sometimes reddened, congested, and œdematous, and sometimes contained hæmorrhagic infarcts. Small areas of primary bronchial pneumonia were encountered in some of the cases, and in one a whole lobe of the lung showed pneumonic engorgement. In two instances either red or early grey hepatization was present. Numerous miliary abscesses were occasionally encountered in the lungs. The areas of bronchial pneumonia were firm, contained no air, and were usually irregular in outline and red, reddish-yellow, or yellow in colour. On cut section they were sometimes wedge shaped. In those instances in which hæmorrhagic infarcts, miliary abscesses, and in addition reddish-yellow or yellow areas of lobular pneumonia were present, one must conclude that the infection of the lung is secondary, and that in these instances one is not dealing with primary pneumonic plague, in which infection enters through the bronchi, but with secondary infection of hæmotogenous origin. Such a conclusion is supported by the microscopical study of these lesions. Sections of the lung in the vicinity of one of the hepatized areas showed the bacteria in very large numbers both about and within the small blood-vessels, and in places infarctions had occurred; numerous hæmorrhages from the vessels had also taken place; in the neighbourhood of the pneumonic areas the bacteria were also plentiful in the lung alveoli and in the perivascular spaces.

Therefore, these changes suggest that the primary point of infection did not always occur in the bronchi or alveoli of the lung. From a study of all the lesions in guinea-pigs, it would appear that these animals, under the conditions of the experiments in which the spraying was carried on, did not frequently develop primary plague pnuemonia, but that infection occurred through the mucous membranes of the mouth and throat, resulting in a general septicæmia generally preceded by the formation of early buboes of the cervical glands, and sometimes followed by the development of secondary areas of plague pneumonia. It would appear that in guinea-pigs, either on account of too shallow respiration or the small size of the larynx and trachea, the bacteria are not so likely to penetrate to the smaller bronchi by means of the inspired air. Instead, they are apparently deposited largely upon the mucous membranes of the mouth and throat.

The experiments performed on monkeys seem to throw much more light upon the mode of pneumonic plague infection in man. The lesions in fifty-five monkeys infected by spraying were studied at necropsy. There was a marked similarity in general in the pathological changes encountered. In practically all of the animals there was absence of any sign of plague infection about the cervical tissues. The submaxillary and cervical lymphatic glands and those about the trachea were not swollen, nor was there any œdema of the cervical tissues, as was practically always seen in the experiments with guinea-pigs. In none of the cases examined did the tonsils show evidence of primary disease, though in a number of instances they were sectioned and stained. In some instances they were moderately congested. Plague bacilli were scanty in them, and when present were not more numerous than in the heart's blood, and never so numerous as they were in the lungs or spleen.

There was frequently œdematous fluid in the trachea, and in a few cases the trachea was slightly reddened. The larynx and vocal cords were not as a rule injected. There was not such marked evidence of septicæmia as seen in the experiments with guinea-pigs, but plague bacilli could always be recovered from the heart's blood by culture. No hæmorrhages were noted in the intestines and omentum. The spleen and liver showed no miliary abscesses. There were no cervical, axillary, nor inguinal buboes. The lungs showed primary pneumonic changes in every case. There was always much œdema. In those animals which succumbed a shorter time after infection, the lobular type of pneumonia was much more frequently encountered. In those which survived a longer period, whole lobes of the lung usually showed pneumonia. The process evidently begins as a lobular bronchial pneumonia. By the fusion of a number of the areas of lobular pneumonia, the whole lung may become involved. The large pneumonic areas were either in the stage of engorgement or of red or early grey hepatization. In a number of cases a pleuritic exudate was observed over the hepatized areas. In no case were miliary abscesses observed in the lungs. In the cases with the *early lesions*, the plague bacilli were always most numerous in the lungs, and in section were found in greatest profusion about the bronchioles, in the peribronchial lymph spaces and alveoli, and beneath the pleura. In some instances the cells lining the alveoli appeared normal even when they contained large numbers of bacilli. Although the blood-vessels between the lobules and septa were dilated, and hæmorrhages sometimes occurred, practically no bacteria were found within them.

From these observations, it is obvious that the infection in monkeys occurred by inhalation, and resulted in primary plague pneumonia.

It also is evident that in some instances in which monkeys are exposed to infection by inhalation, the primary point of infection may be not only the

lungs, but also the mucous membranes of the mouth and throat. That plague infection may occur through the mucous membranes of the mouth and throat *alone* in monkeys was demonstrated by placing a small quantity of plague bacilli upon the posterior portion of the throat by means of a glass rod.

These animals all died of plague septicæmia with or without bubonic infection of the cervical glands; that is, in the cases in which the infection was severe and the susceptibility of the animals more marked, they succumbed to septicæmia before cervical buboes developed. In none of these instances was pneumonia present. Primary plague pneumonia only results when infection by inhalation has in addition taken place.

It has been claimed by several observers, and more recently by Koulecha, that pneumonic plague in man is primarily a septicæmic disease, the lungs becoming secondarily involved by way of the blood circulation. According to this observer, the infection is supposed to spread from the perivascular spaces to the neighbouring lung alveoli. He further believes that the bacilli enter the blood by the lymph vessels through the lesions in the tonsils, and are deposited in the interstitial tissues around the lung alveoli, the tonsils being regarded as the primary point of infection. In some instances he assumes it to be possible for the plague bacilli to pass from the mucous membranes of the trachea and bronchi to the neighbouring lymphatic glands, and from them to enter the blood, and in this way later to reach the lung. Albrecht and Ghon have shown that by the intravenous injection of plague bacilli in animals, pneumonic plague did not result.

Strong and Teague are of opinion that the view that pneumonic plague is primarily a septicæmic disease and that the lungs become secondarily involved by way of the blood circulation, and that the tonsil is first infected is not acceptable.

From their study of pneumonic plague both in man and animals, they feel justified in concluding that infection in epidemic pneumonic plague results from inhalation, the primary point of infection being not in the tonsils, but some portion of the bronchi, the organism either passing along the bronchioles directly to the alveoli or through the walls of the bronchioles to the contiguous tissue of the lungs, giving rise, first, to peribronchial and perivascular inflammation in the surrounding tissues, and then to more diffuse inflammatory processes throughout the lung. Having reached the lung tissue, the bacilli rapidly multiply and produce at first pneumonic changes of the lobular type, and shortly afterward more general lobar involvement of the lung tissue.

The blood becomes quickly infected and a true bacteræmia results in every case. The fact that the bronchial glands at the bifurcation of the trachea are always much more severely affected than any of the other lymphatic glands also argues against the theory that epidemic pneumonic plague is primarily a septicæmic disease and that the lungs are infected secondarily from the blood. Moreover, in the earliest stage of the disease, the blood may be free from plague bacilli, as the authors have shown by cultures.

It is true that in some instances the bacteræmia occurs early in the course of the disease and before hepatization of the lung may have taken place. However, microscopical examination will reveal enormous numbers of plague bacilli in the engorged lung tissue, from which it appears that the origin of the bacteræmia is clear.

The tonsils may become secondarily infected in pneumonic plague just as other lymphatic glands—for example, the bronchial ones—become so infected. However, in pneumonic plague death usually occurs before any marked macroscopic changes occur in the tonsils. There is no doubt also that the tonsils may become primarily infected in epidemics of pneumonic plague just as has occurred in sporadic cases in epidemics of bubonic plague; such cases have been previously reported. This, however, is not the common channel of primary infection, and in such cases involvement of the glands of the neck occurs early in the course of the disease. Such cases are really instances of bubonic plague in which the lungs may, or may not, become secondarily infected.

In some instances plague infection may occur directly through the mucous membranes of the mouth and throat. Primary septicæmia may then result. In those instances in which the infection is virulent and severe, and the susceptibility of the host marked, death may sometimes occur before bubonic involvement is apparent. In other instances, bubonic involvement of the glands of the neck and septicæmia are present. No true pneumonia occurs unless infection by inhalation has in addition taken place. The German and the Austrian Plague Commissions concluded that primary plague septicæmia probably does not exist. However, these Commissions made their observations only during epidemics of bubonic plague. From studies made upon human beings, during the Manchurian epidemic, as well as from the animal experiments quoted above, the authors conclude that primary plague septicæmia does sometimes take place and that death may occur, though rarely, before visible lesions have taken place either in the lungs or lymphatic glands.

(To be continued.)

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4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

PRELIMINARY NOTES ON A TRYPANOSOME CAUSING DISEASE IN MAN AND ANIMALS IN THE SEBUNGWE DISTRICT OF SOUTHERN RHODESIA.

By Ll. E. W. Bevan, M.R.C.V.S.,
Government Veterinary Bacteriologist, Southern Rhodesia.

Introduction.

The various strains of trypanosomes used in these observations were obtained by Drs. Fleming, Stohr, and Huggins in November, 1912, from natives and animals found to be suffering from trypanosomiasis in the vicinity of the Busi River, Sebungwe District, Southern Rhodesia.

Blood taken from these natural cases was inoculated into clean rabbits kept in fly-proof cages, which were returned without delay to the Veterinary Laboratory, Salisbury.

Six animals were thus inoculated, namely, two rabbits with each of the following strains:—

(1) *Human strain*, from a native from Siandola's Kraal, carrier to Dr. Stohr. Two rabbits (Nos. 1 and 2) inoculated October 21, 1912.

(2) *Dog strain*, from Native Commissioner's dog, which had been with its master through the fly area some six weeks previously and had visited the

Sebungwe Trypanosomiasis.

First passage into rabbits. Inoculated, October 21, 1912. *Received Salisbury, October* 29, 1912.

Date	Human strain		Dog strain		Goat strain	
	Rabbit 1	Rabbit 2	Rabbit 3	Rabbit 4	Rabbit 5	Rabbit 6
October 29, 1912 ...	2—100*	100—100	100—100	Negative	5—100	Negative
,, 30 ,, ...	...	400—100	300—100	...	2—100	...
,, 31 ,, ...	...	Numerous	Negative	...	Negative	Negative
November 1, 1912 ...	300—100	500—100	,,	Negative	,,	,,
,, 2 ,, ...	...	Dead	...	...	...	...
,, 3 ,, ...	Dead	...	...	...	...	...
,, 4 ,, ...	...	...	20—100	Negative	5—100	3—100
,, 7 ,, ...	...	...	4—100	3—100	200—100	Negative
,, 9 ,, ...	...	...	Dead	...	...	...
,, 12 ,, ...	...	...	...	1—100	400—100	Negative
,, 14 ,, ...	...	...	...	Negative	Negative	,,
,, 15 ,, ...	...	...	...	10—100	...	...
,, 17 ,, ...	...	...	...	...	Dead	...
,, 18 ,, ...	...	...	...	10—100	...	4—100
,, 19 ,, ...	...	...	...	3—100	...	...
,, 22 ,, ...	...	...	..	1—100	...	20—100
December 2 ,, ...	...	...	...	Negative	...	20—100
,, 5 ,, ...	...	...	...	...	...	1—100
,, 12 ,, ...	...	...	...	1—100	...	Negative
,, 18 ,, ...	...	...	...	3—100	...	,,
,, 20 ,, ...	...	...	...	...	...	Re-inoculated
,, 26 ,, ...	...	...	...	...	...	Dead
January 24, 1913 ...	...	...	...	Alive	...	...

* Average of trypanosomes found in 100 fields.

Table showing Periods of Incubation and Duration of Disease in Rabbits Inoculated from Natural Cases.

	Period of incubation	Duration of disease
Human strain—		
Rabbit 1	Infected on arrival, therefore less than 8 days	13 days.
Rabbit 2	Ditto	12 days.
Dog strain—		
Rabbit 3	Ditto	19 days.
Rabbit 4	17 days	Chronic (alive January 24, 1913).
Goat strain—		
Rabbit 5	Less than 8 days ...	27 days.
Rabbit 6	14 days	Chronic (re-inoculated December 20, 1912, and died, December 26, 1912).

Table showing Periods of Incubation and Duration of Disease in Animals Sub-inoculated from above Rabbits.

Origin of virus	Dogs		Sheep	
	Period of incubation. Days	Duration of disease. Days	Period of incubation. Days	Duration of disease. Days
Human strain—				
Through rabbit 2 ...	4	34	4	49
Dog strain—				
Through rabbit 3 ...	5	22	8	Alive January 24, 1913.
Goat strain—				
Through rabbit 5 ...	8	26	8	Alive January 24, 1913.

Busi Valley. Two rabbits (Nos. 3 and 4) inoculated October 21, 1912.

(3) *Goat strain*, from a sick goat at Siandola's Kraal, on the Busi River. Two rabbits (Nos. 5 and 6) inoculated October 21, 1912.

The table of observations (p. 113) made of these six rabbits is given in some detail, since being the first passage, in similar animals, of trypanosomes obtained direct from their natural hosts, the results are of more importance for purposes of comparison than those obtained after a series of subinoculations.

Morphology.

Living, Unstained.—The movements of trypanosomes taken from Rabbit No. 1 (human strain), Rabbit No. 3 (dog strain), Rabbit No. 5 (goat strain), were similar. The parasites were seen to wriggle violently "sur place," but showed no active translation. When they left the field they could easily be followed up and kept under observation. In these respects they corresponded with similar preparations of the Ellacombe strain of the so-called *T. rhodesiense*, which were obtained from a rabbit for purposes of comparison.

Dr. Fleming, who examined living preparations taken from the original hosts in the field, expresses the opinion that the trypanosomes in subinoculated animals are less active.

Fixed and stained with an Azur-Eosin modification of Giemsa stain, the trypanosomes encountered in Rabbits Nos. 1 and 2 (human strain), No. 3 (dog strain), and No. 5 (goat strain), and in animals subinoculated from them, have appeared identical.

"Tadpole" forms of "pecorum" type, short and stumpy, intermediate and long free-flagellated forms of "nagana" type have been encountered, but it has not been possible to draw any sharp divisions between one type and the next, the one merging into the other.

The posterior extremity of the trypanosomes has differed with the various types; in the long free-flagellated varieties it has been drawn out to the extent of some 5 microns beyond the kinetonucleus, thus presenting the "snout" and "pike-headed" forms commonly described. In shorter forms it has been less prolonged and has appeared conical or rounded, the kinetonucleus being relatively nearer the end, and sometimes actually at the end. In blood from dogs about to die the "hippo-headed" forms described by Bruce, and shown in the drawings of the trypanosomes of Nyasaland, have been encountered, being most numerous at the edges of the film.

A number of individuals in each of the strains have showed numerous large metachromatic granules, not only in the anterior but also in the posterior half of the body.*

These granules were seen as frequently in the posterior as the anterior half, and were present in all forms of the parasite. Some types contained three or four granules close to and as large as the kinetonucleus, which could only be distinguished by its association with the flagellum. In some specimens the nucleus appeared diffuse with granules embedded in its substance; in others granules appeared to be situated in the undulating membrane close up to the flagellum.

In some individuals the granules in the anterior portion of the body have showed the peculiar arrangement described by Kinghorn and Yorke† in connection with the human trypanosome of North-East Rhodesia, *viz.*, "a row along either side of the trypanosome with a clear strip of protoplasm intervening," but in the majority of parasites they were not so arranged.

The nucleus was round or shortly oval, and generally situated about the centre. In each strain, and especially when stumpy types of parasite prevailed, forms were met with having the nucleus situated in the posterior third. The number of parasites met with in preparations of the peripheral blood of rabbits and dogs varied from an average of 1 to 500 in 100 fields. Just before death as many as twenty in a field could sometimes be counted. In sheep, parasites were rarely found, and the course of the disease had to be considered from the temperature and clinical symptoms. In these respects the Sebungwe trypanosome corresponds very closely with that met with in animals inoculated with the original W.A. strain of *T. rhodesiense* (*Veterinary Journal*, 1911, p. 41).

The following measurements were made of trypanosomes obtained from the original first passage rabbits:—

Strain	Rabbit No	Minimum	Average	Maximum
		Microns	Microns	Microns
Human ...	1	11	23.15	33
Dog	3	12.6	21.12	31.5
Goat	5	10.8	20	31.5
Average ...	...	11.46	21.42	32

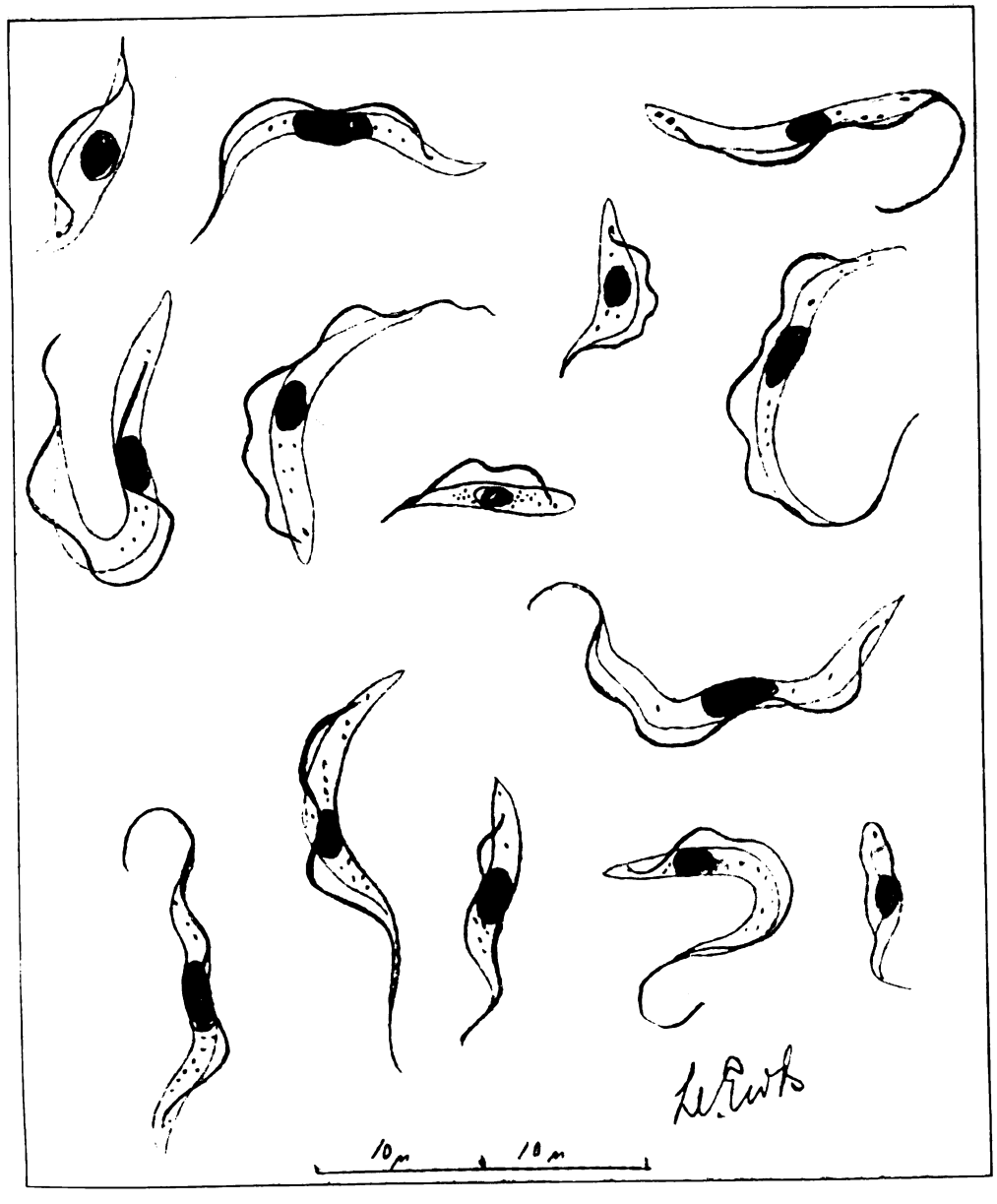
The discrepancies in the above may have been due to the fact that the preparations from which the measurements were made were not taken at identical stages of the infection in each host, the proportion of types varying considerably from day to day. However, the measurements of the Sebungwe strains do not differ more from one another than do those given by various authorities for *T. rhodesiense* and trypanosomes of the same class, as may be seen from the table on p. 117.

From the above it will be seen that the Sebungwe trypanosome in the rabbit—first passage from its natural hosts—shows shorter minimum and maximum

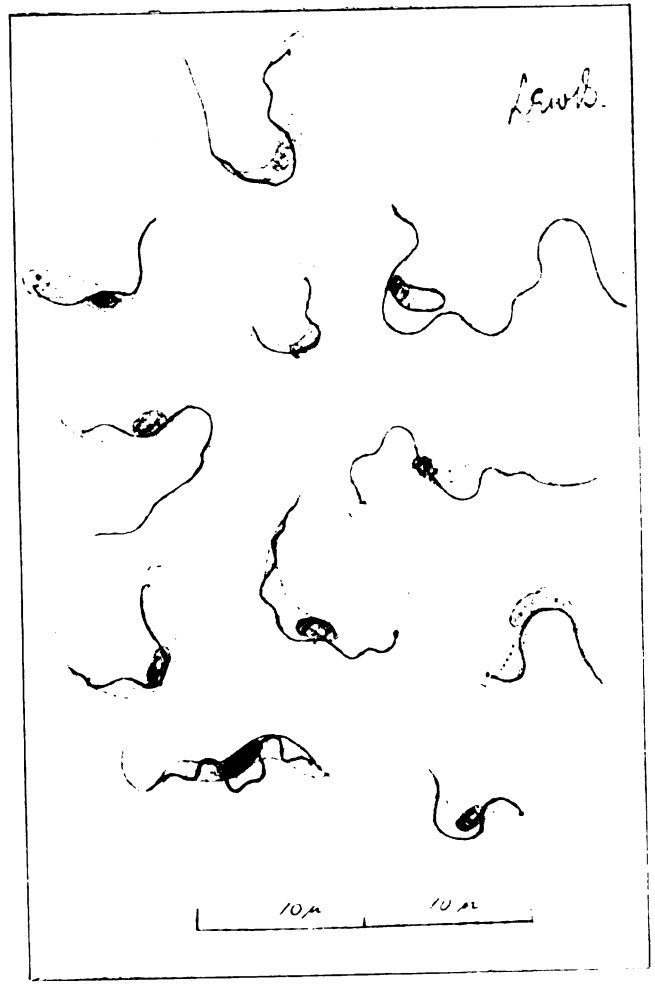
* *T. brucei* is often described and depicted as having a number of such granules in front of the nucleus, a feature which is said to differentiate it from *T. evansi*. In Lady Bruce's drawings of the *T. brucei* of Uganda posterior granules are shown in the short and stumpy types, but not in the long types. In the drawings of *T. dimorphon* (*T. brucei* ?), Khartoum, granules are seen in the posterior half of the long forms.

"Reports of the Sleeping Sickness Commission of the Royal Society," No. xi, section 27, plates 4 and 5.

† *Annals of Tropical Medicine and Parasitology*, March 29, 1912, vol. vi, No. 1a, p. 9.



The Trypanosome of Sebungwe District.

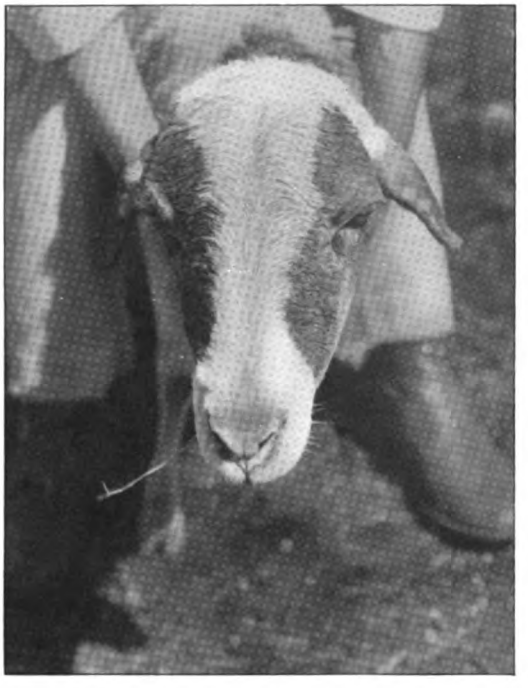


Sebungwe Trypanosomiasis

Trypanosomes seen in a blood smear taken from a dog naturally infected in the Busi Valley.

To illustrate paper by LL. E. W BEVAN, M.R.C.V.S., "Preliminary Notes on a Trypanosome causing Disease in Man and Animals in the Sebungwe District of Southern Rhodesia."

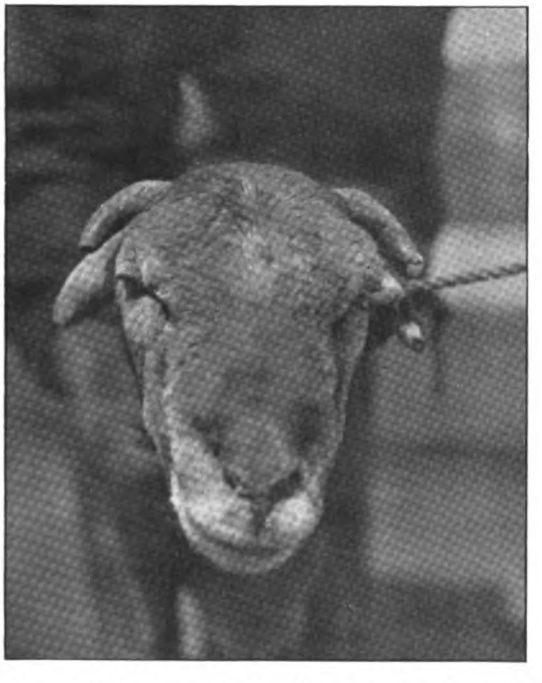
PLATE 2.



A

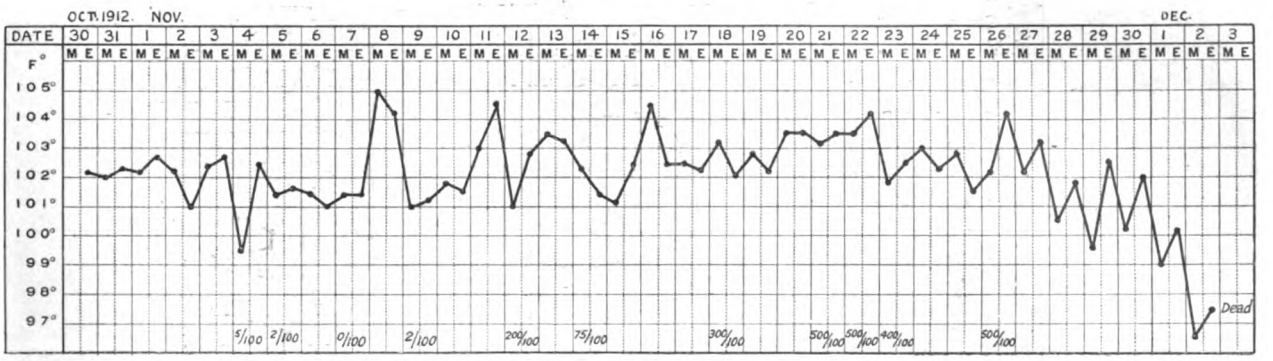
B

A and *B*. Sheep infected with Sebungwe Trypanosomiasis.

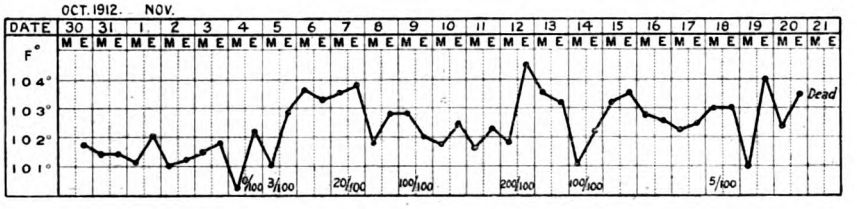


Sheep infected with the original "W.A." strain of *T. rhodesiense*.

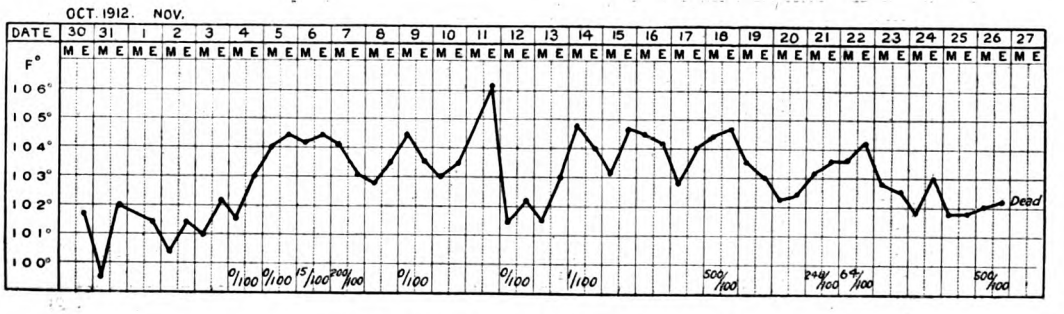
To illustrate paper by LL. E. W. BEVAN, M.R.C.V.S., "Preliminary Notes on a Trypanosome causing Disease in Man and Animals in the Sebungwe District of Southern Rhodesia.'



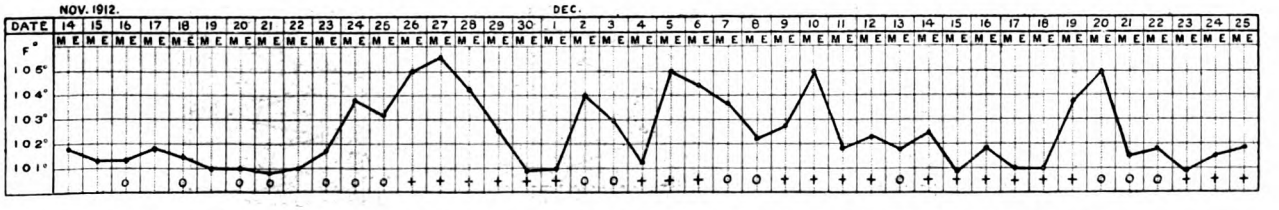
Brindle Dog "Snap" (Human strain).



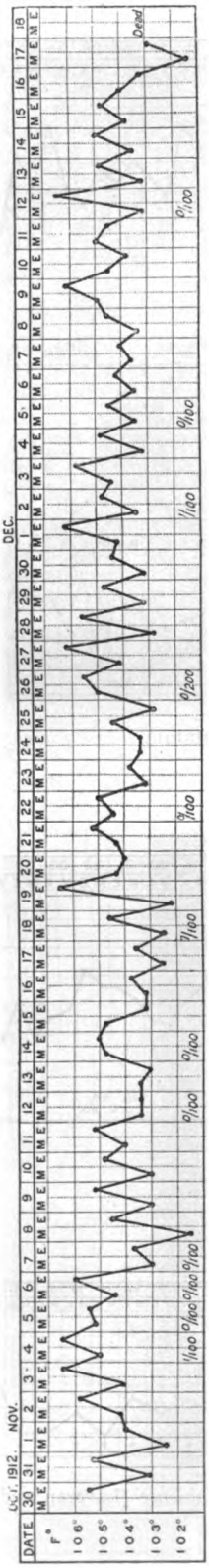
Brown and White Dog "Tiddley Winks" (Dog strain).



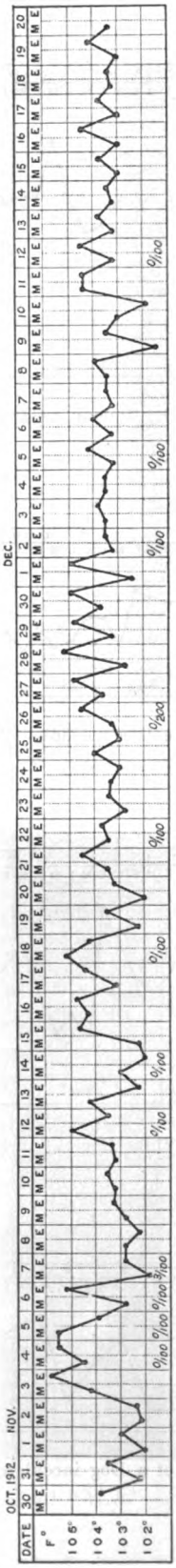
Black and White Dog "Bob" (Goat strain).



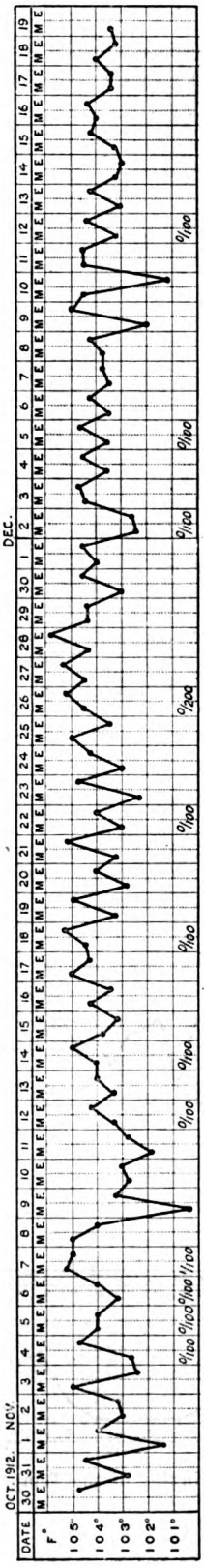
The beginning of the Temperature Chart of a Dog inoculated with *T. gambiense* (Laveran and Mésnil).



Black and White Sheep (Human strain).



Hornless White Sheep (Goat strain).



Black Sheep (Dog strain).

A Comparison of Measurements of Various Trypanosomes.

Species	Observer	Host	Minimum	Average	Maximum
Sebungwe Trypanosomiasis.					
			Microns	Microns	Microns
Human strain	Bevan	Rabbit	11.0	23.15	33.0
Dog ,,	,,	,,	12.6	21.12	31.5
Goat ,,	,,	,,	10.8	20.0	31.5
Average...	...	...	11.46	21.42	32.0
T. rhodesiense.					
			Microns	Microns	Microns
	Stephens and Fantham	Rabbit	14.0	19.4	27.0
	,,	Various hosts	12.0	23.6	39.0
	Kinghorn and Yorke	Human	13.25	21.25	39.0
	,,	Game	11.75	21.38	35.5
	,,	Fly	13.0	21.67	36.25
T. gambiense.					
			Microns	Microns	Microns
	Bruce	Rabbit	13.0	22.1	33.0
T. brucei.					
			Microns	Microns	Microns
	Bruce	Rabbit	13.0	23.2	38.0

forms than allied species of trypanosomes, but that the average corresponds very closely with Kinghorn and Yorke's estimate of *T. rhodesiense* as met with by them in man, game, and flies.

Clinical Symptoms.

Rabbits have become very emaciated, but have not shown the œdema of the head which characterized the infection produced by the strain of trypanosome obtained from W.A. one of the first to become infected with the human trypanosomiasis of the Luangwa Valley.

Dogs.—There has been no marked difference in the symptoms set up by the various strains of trypanosomes. Dogs have shown intense anæmia and weakness, and have rapidly wasted away. During the last few days they have appeared dull and sleepy, and have remained lying upon their sides in a helpless condition. When called by their names they have wagged their tails, but made no attempt to rise. Opacity of the cornea has developed in each case. No marked œdema of the face has been noted. The temperature charts herewith of the three dogs may be compared with that given in the English edition of Laveran and Mesnil's work on "Trypanosomes and Trypanosomiases," p. 386.

Sheep.—The progress of the disease in sheep has been slow, and characterized by marked and prolonged elevations of temperature. Shortly after inoculation some degree of œdema of the face has developed, and it was at first thought that this symptom closely identified the disease with that caused by the so-called *T. rhodesiense*, but this œdema did not increase to the same extent as did that of sheep inoculated in 1909-10 with the Luangwa trypanosome, but rather showed a tendency to reduce. The same results were obtained with each strain.

Rats.—Since the above observations were made we have received from the Onderstepoorte Laboratory a number of white rats with which experiments can be more rapidly and economically performed.

It is too early to venture upon a diagnosis of the parasite with which we have to deal. The presence of the small "tadpole" types in close association with and inseparable from "nagana" types is very confusing and might suggest that we are dealing with a mixed infection were it not for the fact that the same phenomenon has been met with in subinoculated animals, whether the virus has been derived from man, dog, or goat. It seems improbable that two species of trypanosome should exist coincidently in three distinct species of host.

The fact that posterior nuclei have been frequently found does not justify us in regarding this parasite as *T. rhodesiense*, inasmuch as such forms have been met with by Blacklock in a strain of *T. brucei* from Uganda, by Wenyon in an animal trypanosome of the Bahr-el-Ghazal, and by Yorke and Blacklock in a strain of *T. equiperdum*.

It will be noticed that no reference is made in this report to the results obtained in Rabbits Nos. 4 and 6 and their subinoculated animals. These have necessitated a separate series of experiments which are not yet completed, but which are of sufficient interest to merit a separate report which will be presented in due course.

Blood smears taken by the members of Dr. Fleming's party, and independently by Mr. Jack, Government Entomologist, from wild animals shot in and around the Sebungwe "fly" area, were stained and examined at this laboratory. No parasites could be found in preparations from three eland, two zebra, five m'pala, a tsessebe, a roan antelope, three duyker, a waterhog boar, two reedbuck, a sable bull, and five waterbuck, but in three other waterbuck trypanosomes were encountered. In one the parasites were very scanty, but in the other fairly numerous, on an average one in a hundred fields.

No distinction could be drawn between these trypanosomes and those met with in infected natives and domestic animals in the Busi Valley. They were long forms of the "nagana" type, and many showed the posterior granulation previously referred to.

Smears were also taken from a dog noticed to be sick at Sinamzangwa's Kraal, and these proved very rich in trypanosomes of all types, from the "tadpole" forms measuring no more than 9.5 microns to the long free-flagellated forms 35 microns long. Some idea of the varieties met with is given by the drawing, showing eleven parasites which presented themselves in three fields.

FILARIA LOA CASES: CONTINUATION REPORTS.

By George C. Low, M.A., M.D.
Lecturer, London School of Tropical Medicine.

In a paper published in the Journal of Tropical Medicine and Hygiene, January 2, 1911, on *Filaria loa*, the clinical histories of five cases of infection with that parasite were given. At that time I stated that prolonged investigations of individual cases were required to clear up much of the obscurity which the different symptoms of the disease bore to each other. In 1912 (Journal of Tropical Medicine and Hygiene, February 1, 1912) I examined the blood of Case III again, and found a persisting eosinophilia and a persisting absence of embryos in the peripheral blood. Lately I have had the opportunity of seeing this case again, and also two of the other ones, *viz.*, Cases IV and V. The results of the examinations of these cases are of great interest, but before going into them in detail, one must mention a very interesting paper by Meinhof* on the same subject.

This author had the exceptional opportunity of following up a case of *F. loa* over many years in much the same way as I am doing with my cases now. Meinhof's case was a lady who went out to the Cameroons in 1903. In 1905, after several attacks of severe fever, multiple swellings, having all the characteristics of Calabar swellings, appeared. For the next years these swellings kept coming and going, but it was not until May, 1911, that an adult filaria appeared. At this date, six years after the first swellings were noticed, a male *F. loa* measuring 2 cm. in length was extracted from the left eye. In October, 1911, the author examined the patient's blood, but did not find filarial embryos in it. The eosinophiles were then 8 per cent. On December 15, 1911, a filaria appeared under the left eye, but was not extracted. On January 4, 1912, loa embryos were found, for the first time, in the blood, and a differential count of the leucocytes on that same day gave the eosinophiles at 22 per cent. On February 2, 1912, a male adult measuring 2½ cm. in length was removed from beneath the conjunctiva of the left eye, and on various occasions embryos were again found in the peripheral blood. Another worm was extracted in July, 1912.

If the date of the infection of Meinhof's case is taken at 1905, when the first Calabar swellings appeared, then the first adult filaria appeared six years afterwards and embryos eight months after that, *i.e.*, almost seven years from the beginning of the infection. Such a result helps to explain the persisting absence of embryos in some of the cases now to be described.

Case III.—After seeing this case on January 2, 1912, the patient returned to Africa, but to a non-endemic area. From that date until he was seen again in London, April 7, 1913, his filarial manifestations were few in number, no further Calabar swellings appearing, but once or twice he felt a filaria near his left eye, and on another occasion had the sensation of one wriggling about under the skin in front of his left ear. His blood examination (April 7, 1913), the eighth, gave the following results:—

Reds	4,500,000	Size and shape of corpuscles normal. No malarial or other parasites.
Whites	7,400	
Hæmoglobin ...	90 %	

Differential.

	Number of leucocytes counted	Percentage	Number of leucocytes per cubic millimetre
Polymorphonuclears ...	285	57	4218
Large mononuclears ...	21	4.2	310.8
Lymphocytes	125	25	1850
Eosinophiles	66	**13.2**	**976.8**
Transitionals	2	0.4	29.6
Mast cells	1	0.2	14.8
Total	500	100.00	7400.0

Five slides of blood each containing 20 c.mm., *i.e.*, 100 c.mm. in all, were examined for filaria, but the results were again absolutely negative. The eosinophilia, however, as the table shows, persists as it did in 1912, and this fact, together with the appearance of the filaria in the vicinity of the eye, points to the infection still going on.

As I have already stated in previous communications, the failure to find embryos at any given time, even though large quantities of blood are taken, does not necessarily mean that they may not have been present in the intervals between the examinations.

This on the whole, however, is unlikely, because when embryos once appear they are remarkably constant in their presence, and may be found at any time during the day over periods of years (*vide* Case V later). In a case of Sir Patrick Manson's at the London School of Tropical Medicine which I used to study the same thing occurred, and I have also seen it in others as well.

I think, therefore, that the absence of embryos in the eight different examinations made on Case III over a prolonged period of time mean that for some reason or other they have never been there.

Case IV.—After my examinations of this case during 1910 and the early part of 1911 the patient returned to Northern Nigeria in February, 1911, the endemic area in which he acquired the disease. In the course of his following tour he five times got a fleeting swelling on the back of the right wrist. These swellings came up suddenly, they did not feel hot, there was no pain, and they only lasted a day or so (Calabar swellings). In April, 1912, he got boils which kept coming and going until his arrival in England, June, 1912; they then disappeared, and he has not had them since. During his tour he had one attack of fever, and on some other occasions felt somewhat off colour, but had no temperature. Since his return home no further indications of filariasis have manifested themselves.

* "Zur Klinik und Morphologie der Filaria und Mikrofilaria loa (diurna)," Beihefte zum *Archiv für Schiffs- und Tropen-hygiene*, 1913, Band xvii, Beiheft 2.

The physical examination showed all the patient's systems to be practically normal; the spleen was very slightly enlarged, the blood examination was made on September 3, 1912, with the following results:—

Reds	4,880,000	Size and shape of red corpuscles perfect. No malarial or other parasites.
Whites	8,200	
Hæmoglobin ...	95 %	

DIFFERENTIAL.

	Number of leucocytes counted	Percentage	Number of leucocytes per cubic millimetre
Polymorphonuclears ...	262	52.4	4296.8
Large mononuclears ...	18	3.6	295.2
Lymphocytes	131	26.2	2148.4
Eosinophiles	85	17	1394
Transitionals	3	0.6	49.2
Mast cells	1	0.2	16.4
Total	500	100.0	8200.0

Four slides of blood each containing 20 c.mm., that is, 80 c.mm. in all, were examined for filariæ, with negative results both as regards *F. loa* and *F. perstans* embryos. An embryo of the latter, it may be remembered, was seen once in 1910, but that infection has now apparently completely died out.

It is now practically two years since I first examined the patient, and it is well over two years since he first saw his filaria in his eye, *i.e.*, four years in all.

Further, fugitive swellings have appeared in the last years on his arms, and this probably means that there are more adults moving about in his subcutaneous tissues. Re-infection cannot also be excluded in this case, as he returned, as mentioned above, to an endemic area.

Embryos have not yet appeared in the blood, but, as the blood-count shows, the eosinophilia still persists, and is higher than it was at my first examinations.

Case V.—The synopsis of this case in my paper in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE of January 2, 1911, was as follows: "This is a somewhat remarkable case; the patient had been over three and a half years away from the endemic area (all that time living in this country), and had never presented any signs of filarial infection. I simply examined his blood on the off-chance of something, as he had been in Nigeria, and was rewarded by finding the embryos. His subsequent history should be interesting."

After writing that paper I again saw the patient on February 21, 1911, and 20 c.mm. of blood taken in the morning showed thirty-six filariæ present. After this date I lost sight of him until the other day (April 8, 1913), when he came to see me again. During the last two years he has been abroad, but never in a *F. loa* endemic area.

During the whole of this time he has never shown the slightest signs of Calabar swellings or of any filaria moving about either under the skin or about the eyes; he has lately, however, complained of a little breathlessness and a suspicion of some precordial pain with slight palpitation. Whether this has anything to do with the *F. loa* infection or not it is difficult to say, but in this connection it is interesting to note that Meinhof's patient also developed cardiac symptoms, *e.g.*, irregularity of the heart, with some increase in the diameter towards the left.

I made a careful physical examination of the heart, but could detect no increase in its size, nor were there any murmurs indicative of organic disease. As the patient was and had been a heavy smoker I suspect tobacco may have had something to do with it.

A complete blood examination gave the following:—

Reds	5,160,000	Size and shape of corpuscles perfectly normal. No malarial or other parasites.
Whites	7,400	
Hæmoglobin ...	100 %	

DIFFERENTIAL.

	Number of leucocytes counted	Percentage	Number of leucocytes per cubic millimetre
Polymorphonuclears ...	264	52.8	3907.2
Large mononuclears ...	26	5.2	384.8
Lymphocytes	117	23.4	1731.6
Eosinophiles	86	17.2	1272.8
Transitionals	4	0.8	59.2
Mast cells	3	0.6	44.4
Total	500	100.0	7400.0

Examination for Filariæ, 12 noon.—Five slides containing 20 c.mm. of blood each were examined. The following numbers of filariæ were counted in each: 46, 37, 42, 35, 36, or a total of 196 in 100 c.mm. of blood, *e.g.*, an average of 39.2 per slide.

These embryos had all the anatomical and other characteristics of those of *F. loa*, being quite typical in every respect. Of course, the time at which the blood was taken (12 noon) would show the embryos at their greatest number, but, even granting that, such a number per 20 c.mm. of blood* must mean quite a good infection of adults.

Why these should have never come near the surface of the body it is difficult to say; possibly they are living in the deeper tissues of the chest or abdomen; but even so, one would have thought that in the long period of time the patient has had his infection, some of them would have come up under the skin. One thing the history of this individual case emphasizes very clearly is the long time that such an infection may persist. Two years have now elapsed since I examined the patient in 1911, and to that time have to be added the three and a half years which elapsed between his

* I now always use the measurement 20 c.mm. of blood as my standard, and would suggest that other filariologists might adopt the same. By doing so more harmonious results would be obtained in the comparisons of numbers of filariæ present in the blood at any given time. The blood is blown out on to a slide, spread into a film, dried, dehæmoglobinized by placing in water, fixed and then stained in the usual manner.

leaving Nigeria and my first examination of him. This makes five and a half years away from the endemic area. That the fecundity of the breeding adults has not diminished in the last two years is also shown by the number of embryos per 20 c.mm., this coming out at practically the same as in 1911.

Other points of interest brought out by the complete blood-counts of these cases are that the infection does not produce anæmia. The red corpuscles are just about normal in numbers, and their size and shape are good. The leucocytes again are not influenced, 7,000 per c.mm. or thereabouts being the usual thing. In differential leucocyte counts eosinophilia is the feature in the blood, and this is a distinctly high one, much more so, for example, than in cases of *F. bancrofti*.

Not only are these cells differentially increased, but they are absolutely so as well. Normally taking the leucocytes as 7,000 per c.mm., the eosinophiles should total from 140 to 280 per c.mm., but as will be seen from the details of the examinations given above, in *F. loa* infections, they are absolutely increased to as high as from 976 to 1,394 per c.mm.

What this means is by no means clear. It may be produced by some toxin excreted by the worms, but if this is so it certainly does not appear to influence the general health detrimentally, or at least as far as one can determine clinically.

With Leiper's discovery of a chrysops as the intermediate host of *F. loa* our knowledge of the life history of this parasite is gradually becoming complete. We can, for example, easily distinguish the embryos from those of *F. bancrofti*, and practically all that is required now is to solve the riddle of why, in so many cases of the infections, embryos are so long in appearing in the peripheral blood. Do some cases occur in which they never appear at all? Clinically also, several points require solution.

One must, before concluding, refer to the most instructive and interesting paper by Fülleborn* on the morphology and differential diagnosis of microfilariæ, which has recently appeared. In it the distinction between loa and bancrofti embryos is summed up most clearly, and many excellent plates give all the details of the minute anatomy of these and the other human embryos. His system of measurements should be adopted by all workers on the subject of filariasis.

CLIMATIC AND OTHER FACTORS INFLUENCING THE HEALTH OF EUROPEANS IN UGANDA AND EAST AFRICA.†

By Dr. A. R. Cook.
C.M.S., Uganda.

Dr. Cook prefaced his remarks by giving his personal experiences when landing and his experience with members of his party.

Climatic Conditions in Uganda.—The word climate connotes a complex of conditions, not only that of temperature, but also the pressure of the atmosphere, the prevailing winds, the actinic effects of the sun's rays, and intimately bound up with the climate are the bites of insects, and lastly, there is dust.

Temperature.—The diurnal range in Uganda is extremely small, and the person who arrives in the country fresh from home, seeing little rise of temperature in the day, thinks the climate is a very fine one; but it is really a very bad one.

Look outside now and see what deplorable conditions you live in in England! In comparison that of Uganda is delightful in the extreme. But although the climate of England is deplorable, yet, in that very deplorable condition which God has given to the Anglo-Saxon, so varied, we see one of the factors in producing a character of that kind which calls out all the moral forces of a man, and in this we have the secret of a high national character.

We find in Uganda the range of temperature is very small. The adaptability of a European for a climate depends very much on the range of climate. In many places during the year there is a very wide range of temperature, but in Uganda the lowest temperature recorded by myself was 59° F. and the highest 86° F.; I think you will realize the significance of such a thing. The ordinary low temperature of the day is 65° F., and it rarely rises above 85° F. The temperature varies between 65° and 85° F. year in and year out. This must affect the physical condition. What we feel in Uganda is chill. There is no cold. With the very narrow range of temperature the climate is distinctly enervating to any European. You feel after a time that you must more and more bring your moral forces into play. You get up feeling tired each day.

We all know the immense advantages of the cold bath. If you are exposed to great and sudden heat the well-trained body has the cutaneous arterioles in a very responsive condition; that is very largely lost in Uganda.

Having this temperature in Uganda, when we come home we find the vessels have to be retrained to stand the cold. When one inquires of people home from the Tropics, one realizes that those who have had a small range of temperature feel the cold of England very much, and feel it for several years. Very few Europeans are able to keep up the cold bath which they used to enjoy in England. Sometimes we find people who keep it up for a year, but sooner or later the inevitable result follows and they get no reaction after the bath. At first, though the water is not cold, you feel chilly and depressed afterwards, and it is even more dangerous should you be carrying, as many do, the germs of malaria, as a cold bath is apt to rouse these into activity.

When I was travelling in the Sudan from Uganda, about a six-weeks' journey, marching to Mongalla, I came to a very well-known unhealthy station. When I got to this place, after a long march of twenty miles, I was kindly put up by the Govern-

* "Beiträge zur Morphologie und Differential diagnose der Mikrofilarien," Beihefte zum *Archiv für Schiffs- und Tropenhygiene*, 1913, Band xvii, Beiheft 1.

† Paper read before the Association of Medical Officers of Missionary Societies.

ment Official on the spot, and, not wishing to keep him waiting, I departed from my invariable rule and took a cold bath, not waiting for the water to be boiled as usual. I had hardly emerged out of the bath when I had a headache and my temperature suddenly rose till the next day it was 105° F. Almost as speedily it went down again, and after forty-eight hours was normal. I felt fatigued and exhausted. I had been taking 5 gr. of quinine a day, and I think there is very little doubt that what happened was that the unusual conditions had stimulated into activity latent germs. I would point out, as will be seen by these symptoms, that one cannot take a cold bath with impunity if not accustomed to it. It takes some time to retrain this cutaneous responsiveness.

During the last time when I was on furlough, in 1897, I did not venture to bathe the whole time, but this time I resolved to do so, in spite of disagreeable sensations. We were staying at Woolacombe Bay, where we had probably as favourable circumstances as anywhere this summer. I took my temperature before going into the sea, and I found the temperature depended upon the length of time I spent in the water. After staying only twenty minutes in the sea my temperature dropped 6°. The impression left on my mind was that one did not get the glow one used to get. One had to undertake active exercise on getting out of the sea. If I had sat down on a rock I should have been decidedly depressed in health, but by running about I regained a normal condition.

In observing the health of people coming from Uganda to the English winter one finds a tendency to bronchitis. Many children who are born out there are especially liable to bronchitis when they come home. One family left Uganda some years ago with several children, and one boy has had bronchitis every Christmas regularly since then.

Now we will turn to a more cheerful aspect, that of the good to be derived from a sojourn in England. Although the sea bathe is unpleasant there is no doubt it tones up the system. It is quite interesting to see the effect of the English climate on the colour of children. Our two children when we came home exhibited tropical pallor, and although they were pale during the summer, as the autumn came on a proportionate colour came, and now they have as rosy cheeks as any children, which is no doubt due to the tonic effect of the cold.

Nervous System.—There is a certain amount of neuralgia associated with malaria. A man is not ill, but he gets run down. Irritability is a sign of a heightened nervous system which is too often put down to idiosyncrasy. All the reflexes are heightened. When I wish to find what is the general condition of health I try the knee-jerks, and it is very striking to see the brisk reaction of people who have been for some time in Uganda. We notice especially the *effect of small stimuli*, as, for instance, the effect of a sudden noise.

We see the *effect of loneliness* on missionaries, especially in the case of individuals inclined to look on the dark side of things. It is shown more even in men than women. Loneliness may affect very injuriously the health of the man who has been left a long time alone. In fact, there may be in cases unstable equilibrium.

With regard to *insanity*, we see the effect of the climate where there has been a direct family history of insanity. This point is of immense importance to medical officers, and neglect to consider it may lead to disastrous effects.

Next there is the question of *insomnia*. My own plan is to divide sleeplessness into insomnia and mere sleeplessness.

Speaking to medical confrères, few of us have undisturbed nights, and for many years I have slept badly myself, and I am frequently wakened in the night and find a difficulty in getting to sleep again, yet I would not for a moment allow that there was any insomnia in my case.

With reference to many of those people who think they suffer from insomnia, one finds when one carefully goes into the case that they are not suffering from insomnia, and one can set their mind at rest by explaining to them the difference between insomnia and mere sleeplessness.

Many have a certain heightened, keyed-up condition which is really produced by the great mental effort of preparing for the mission field. It is particularly necessary that medical officers should look into the method of cram which is carried on in colleges where the knowledge is given in so-called tabloid form, and concentrated head-learning is stuffed into them. This is by no means the best preparation, and it gives effect to a restless state of mind.

The nervous system is the first that shows signs of stress and strain. The second most important is the

Vascular System.—High blood-pressure is very uncommon in the Tropics. Narrowing our inquiry to missionaries, it is very seldom the case. I have not often taken a blood-pressure under 95 and seldom above 120.

Again, there may be *organic heart disease*. It is very seldom that a person escapes with this condition after the very careful medical examination to which they are submitted before they go out. At the same time some cases of organic heart disease with compensation may do very well.

Tachycardia is very important to our mind. It connotes a difficulty, that of slackened control of the veins. I mean a much looser term by this—undue frequency of the pulse. We find it in people who have been a considerable time in the Tropics. The pulse is unduly sensitive to posture—lying down 60, standing up 80.

I have taken trouble by X-rays to map out the area of the heart to see where it is dilated, out of position, and so on. The dimensions of the heart by X-rays are more or less normal. Undoubtedly the condition improves on getting home to a colder climate. I think there is no harm at all if precautions are taken, and I do not think it is in itself any contra-indication to sending a person to the mission field.

Irritability of the Bladder.—Certain missionaries suffer from irritability of the bladder. In a certain proportion of cases the irritability is undoubtedly due to chemicals, sometimes due to tea, or to the undue concentration of the urine.

Digestive System.—There is remarkably little indigestion among the missionaries in Uganda. Perhaps this is due to the large proportion of vegetable diet.

I have never seen a single case of appendicitis out there during the sixteen years that I have been in Uganda. One of our doctors had an appendix condition which needed the removal of that organ while at home, but he had no attacks while in Uganda.

Cutaneous System.—The cutaneous system is very little affected.

Infected Insects and Worms.

Here there is a tremendously rich field for research. Among the lethal insects which surround us there are mosquitoes, ticks, tsetse, sandfly, &c.

The Problem of Malaria is still the problem of great importance. We are all of us quite unanimous in the Tropics as to the very close connection between malaria and blackwater fever. One can almost go far enough to say to a man, "You are in a ripe condition for blackwater fever."

Standing on Namirembe Hill, where the hospital is situated, and looking out on the valley, 900 yards away is the hill of Kampala, then a mile away is another little hill. Possibly 90 per cent. of blackwater fever cases come from these two hills, yet they are only 900 yards away in one case. This is due to the fact that there are anopheles there and they are often infected.

Quinine.—I deprecate the use of large doses of quinine. One Government doctor gave 80 or 90 gr. I believe the maximum dose which should be given in the day is 30 gr., or even 20. This should be kept up for a few days, then give 10, and then 5 gr. I think we ought to use different sorts of quinine. It is no use to treat every form by one sort. For several years we used the sulphate. Now we use very largely the hydrochloride, and I think on the whole it has done better, but one cannot say even with this that you never get blackwater fever.

Occasionally the taking of even 5 gr. of quinine produces insomnia, or muscular tremors or indigestion, and the addition of some bromide may prevent this.

A senior Missionary was carried into Mengo one day suffering from a double benign tertian attack, and refused to take quinine, as he said it made him feel so nervous. I gave him a hypodermic injection of morphia with quinine, and he did not know that he was taking it. When he recovered I told him, and his delusion was shattered.

One cannot speak too highly of the *great use of cuquinine in children.* I have found it useful in several very serious attacks. It can be given to the children in jam or butter, and they take it without knowing. It can be given in slightly larger doses to adults.

A well-known engineer, who came to me suffering from malaria, said he could never touch quinine, and his doctor in India forbade him. We gave him large doses of euquinine, and he took it without knowing it, with the result that his temperature dropped to normal.

In pregnancy the salt I like is the tannate or hydrochloride with bromide.

Does Blackwater Fever Need Invaliding?—When Dr. Koch came to Mengo we consulted together over a case of blackwater fever, and he told me that he had given up invaliding anyone with blackwater fever. He believed his system of taking quinine every eight or nine days was completely successful, and in only one case had it failed. Then the man, after taking quinine, washed it down with a dozen lager!

There is no system of prophylaxis by quinine against malaria that you can guarantee not to be followed by blackwater fever. The system of 5 gr. of quinine daily is in my own opinion the best method, taken just as one takes a lump of sugar in a cup of coffee in the morning. There is no harm at all if one goes on for months or for years.

When I went to the Sudan and led a party of young fellows, pioneers of the Sudan Gordon Memorial Mission, we pitched our tent at Bor, and one could hardly imagine a worse place. South of us the Belgian Government had had to abandon a station, and north of us the Austrian R.C. Mission had had to withdraw. I told the men that they must take 5 gr. of quinine each day, and they did so, and for twelve months we got practically no attacks. I had just a few attacks of fever with a temperature of 100° F. after I had been especially fatigued. I am sure that all kept their health through that dose of quinine. When I had to go one man departed from the rule; the reason he gave for omitting the dose was that he was so healthy. As a result he speedily got fever.

Selection of Candidates.—For some years people were a little relaxing in the selection of candidates, and the Medical Officers here have had the greatest difficulty in persuading them that Uganda is not a health resort.

A Government officer asked his friend whether he was finding much company on the road to Uganda. "Yes," he replied. "I see plenty of fools going up and invalids coming down!"

Extreme Value of Previous Medical Training.—What a training like Livingstone College does for men is simply invaluable. You will find this the testimony wherever medical men have come across those who have been through the training. It helps to dispel the evil effects of *funk.*

The training also helps to dispel the evil effects of *ignorance*, both as to diagnosis and treatment.

Discussion.

In answer to some questions, Dr. Cook said:—

We have had men who have taken 10 gr. quinine on two days in the week. I do not think 10 gr. twice a week at all sufficient in sub-tertian.

If a moderate attack of blackwater fever, I believe in changing the station first and not invaliding. People may be allowed to return to the country after two attacks.

Some Missionaries go about freely when on duty with a beetroot complexion; others are completely protected from the sun.

With regard to the irritability of the bladder being due to quinine, in one case not a grain of quinine had been taken for many weeks together. In another case a Missionary had two attacks of blackwater fever, and then was living in another place where there was no blackwater fever, and yet had irritability of the bladder.

Advisable not to let any Missionary go out with tachycardia. Take the pulse repeatedly.

In connection with accepting candidates with the history of family insanity, other conditions would have to be very favourable, *i.e.*, the nervous stability of the candidate.

Of the six Missionaries I mentioned who had near relatives suffering from insanity three of them suffered from irritability—not moral.

Cutaneous System.—Boils are not unduly common. Very few kinds have needed medical aid.

As regards *dysentery*, this is quite common in Uganda. I think it is due to at least two causes: (1) Flies; (2) nearly all the dysentery is of vascular type.

With reference to the hypodermic method of administering quinine, we have given quinine in this way in hundreds of cases, chiefly in cerebral malaria and in children.

If a fever resist quinine insistently, undoubtedly it is not malaria.

If one gets a chill one is almost certain to have it.

Quinine is used *per rectum* in cases of infants.

Unusual Cases of Hydatid Disease.—Hall, in the *Australasian Medical Gazette*, February 22, 1913, reports two unusual cases of hydatid disease. The first case had suffered from hydatid disease of the liver, and after being operated upon for this developed a hydatid cyst in the scar of the operation wound. Such a condition is extremely rare, Dr. Clelland, who has been compiling a bibliography of hydatid disease in Australian medical literature, having failed to find a similar case recorded, while the author himself can find no allusion to such a case in any of the text-books at his disposal. The other case was one of double hydatid cyst of the lung. One of these cysts was opened and drained, the patient having a rather alarming hæmorrhage through the tube, as well as considerable hæmoptysis, after the operation. Later it was discovered that what was supposed to be a pleural effusion was really another cyst, and this was drained at a second operation. The adhesion which had formed around the site of the first operation wound prevented much collapse of the lung and consequent hæmorrhage, with the result that the patient stood the operation much better than the first one. The author comes to the conclusion that when double or multiple hydatid cysts are present in the lungs they should be opened separately, or at least one first and the others at a subsequent operation.

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APRIL 15, 1913.

COLLOSOL ARGENTUM.—ITS USE IN SPRUE AND POST-DYSENTERIC CONDITIONS.

COLLOIDAL preparations of metals have been known for some time, but the "collosols"—or chemically prepared colloids—are a very recent addition to our list of therapeutic agents.

So far two collosol preparations are available for use, namely, argentum and hydrargyrum, but within the past few weeks copper has been added to the number. The argentum preparation possesses an interest of itself, for it has been shown by Mr. Crookes's investigations that as a bactericide silver possesses superlative qualities. Upon a silver coin, for instance, bacteria cannot live, whereas upon copper coins they thrive, and also on gold coins they are to be found.

It is no doubt this property of silver which accounts for the universal desire for silver cups, spoons, forks, &c., for domestic use, bearing out the principle that it is practical use and not mere ornamentation which accounts for many of what we have come to look upon as mere decorations. The most marked instance of this is the presence of curtains over our windows; originally of fine muslin, with fine mesh calculated to exclude (malaria) mosquitoes and other insects, the curtains remain with us, although the danger from malaria in England no longer exists. Experience showed the curtains were useful in preventing malaria, although the part played by mosquitoes in its spread was not understood, and they are present to-day in our houses as decorations merely, and with a mesh which is no longer fine, but enriched with "patterns" which cannot exclude insects. Similarly, the desire for silver for practical use,

although the scientific reasons for the desire were not interpreted until lately, has also led to its use for ornamentation. Mr. Crookes mentioned to the writer the action of silver as a preservative by its power of destroying organisms in the case of cut flowers. Mr. Crookes placed cut flowers in vases or bowls of different materials, glass, earthenware, tin, copper, brass, aluminium, &c., and in silver, and found that cut flowers kept many days longer in silver vases than in any of the others he experimented with, and found that the water in which the flowers stood remained freer from organisms when of silver than in the case of any other of the receptacles employed.

The "collosol" preparations consist of metals in suspension as solid particles of extremely minute dimensions, and they microscopically show marked "Brownian" movements. It is believed that the action of collosol depends upon the physical condition of the metals rather than upon their specific action as metals. Moreover, the peculiarity of the metals reduced to the collosol state does not end here, for it is said that their action is parallel with that of organic ferments, so much so that they have been termed metallic ferments.

In the *Lancet* of February 3, 1912, Mr. C. E. A. MacLeod, F.R.C.S., gives an account of many ailments in which he has proved the benefits of collosol preparations, and it was Mr. MacLeod's experiences, and after consultation with Mr. Crookes, that the writer determined to try collosol argentum in cases of intestinal lesions.

Experimentally, it has been shown that collosol preparations inhibit fermentative processes, and it occurred to the writer that this property was one calculated to benefit cases of sprue in which intestinal fermentation is perhaps the most prominent feature of the disease. Moreover, it has also been shown that amongst other bacteria upon which collosol preparations act, it is recorded that the *Bacillus coli communis* is killed within ten seconds. This fact also still further induced the writer to administer the drug; and yet more confidently, seeing that the intestinal flora are legion, that no microbe is known that is not killed in laboratory experiments in six minutes.

The first case in which the writer administered the drug was one in which sore tongue, enormous fermented stools, and the usual symptoms of sprue were present. The dose was one drachm of collosol argentum (Crookes) thrice daily for two days; the effect was immediate, the fermentation in the stools ceased immediately, the stools became somewhat watery and of a green colour, masses of gelatinous-looking material, stained of a bright green, were passed, and the patient felt "bad" in an indefinite way, and ascribed her feelings to the medicine. For this reason the administration was stopped after two days—six doses in all. The stools did not again become bulky or frothy; in fact, the "sprue stools" had disappeared, and in seven days after leaving off the drug the patient passed a stool normal in bulk, in shape and colour.

Experience has shown that the dose (60 minims) was much larger than necessary, and although with "collosols" there is an absolute freedom from toxic effects to the human organism, the writer found that even with 5 minims the stools showed the greenish colour referred to above, and that fermentation disappeared.

The writer has also used collosol argentum in post-dysenteric states, and in (so-called) colitis in patients returning from the Tropics with marked benefit.

The writer now administers the drug as follows: The patient is given a couple of teaspoonfuls (2 drachms) of castor oil on waking, and three hours afterwards collosal argentum in doses ranging from 5 to 60 minims in a tablespoonful (½ oz.) of distilled water; food may be given two hours after the drug has been taken. It is unwise to give the drug soon after food as digestive fermentation is checked by the collosols.

On the second morning the drug may be given early morning on waking, and continued on succeeding mornings until the fermentation in the stools ceases, or until they become green-tinged. Usually two or three doses suffice, and even one dose of 10 minims served to check the fermentation characteristic of sprue stools.

The writer now combines the collosol argentum with the rigidly "meat" diet which he has advocated and used for the past fifteen years.

An interesting paper by Dr. H. C. Drury on "The Cœliac Affection" appeared in *Dublin Journal of Medical Science* of April, 1913. This affection, although it so far has been described in England as occurring in young children only, bears a close resemblance to sprue—the bulky stools, their pale colour, their porridgy consistence, and their frequently frothy condition, combined with marked wasting of the body, all present a picture to the practitioner in the Tropics which suggests sprue. All kinds of diet and drugs failed until Dr. Drury put his patients on a "meat" diet—raw meat, meat extracts, &c. Drs. Gee and Finny had also previously tried "meat" diet in "the cœliac affection" with success. These experiences are a corroboration of the value of meat treatment in intestinal lesions, and the writer, after full fifteen years' experience, has never had occasion to use milk, except on an occasional "fast day," during which for twenty-four or forty-eight hours a "change" seemed indicated. But even with meat fermentation at times supervenes, and when the patient is convalescent and when a fuller diet is observed acid fermentation of the stool at times returns. This may be checked by collosol argentum in small doses properly administered. That the use of this drug is rational it cannot be gainsaid, for fermentation betokens bacterial activity of a pathological type, and the destruction of these organisms by the silver preparation is a safe and effective method of dealing with this, the determining factor in sprue.

J. C.

Abstract.

Studies on Pneumonic Plague.

Protective Masks and Pneumonic Plague.

(*Continued from p.* 112.)

M. A. Barber and Oscar Teague* carried out experiments to determine *the efficacy of various masks for protection against pneumonic plague.* They write: During the epidemic of pneumonic plague which raged in Manchuria during the winter of 1910 to 1911, it was believed and, toward the close of the epidemic, was experimentally demonstrated, by Strong and Teague, that sputum in the form of invisible droplets containing viable plague bacilli was frequently suspended in the air near the coughing pneumonic-plague patients. There was every reason to believe that even the smallest number of these bacilli inhaled into the lung would lead to infection, and that this was, in fact, the common mode of infection in pneumonic plague. The obvious method to protect against such infection was to interpose a barrier to the passage of these droplets into the mouth and nostrils. With this object in view, masks were worn quite generally by physicians and attendants when in the presence of plague patients or suspected cases. That protection was afforded by the masks apparently went unquestioned and, without the sense of security that their use gave, the mental strain in connection with the work would have been almost unbearable.

The total number of deaths that occurred among physicians, nurses, attendants, and inspectors during the recent epidemic of pneumonic plague in Manchuria will never be known. The following death roll at Fuchiatien, the Chinese city near Harbin, shows that the total must have been extremely high.

List of Deaths of Anti-plague Staff at Fuchiatien.—Doctors, 1 out of 20; students, 1 out of 29; native practitioners, 4 out of 9; police inspectors, 2 out of 31; police, 30 out of 688; sanitary police, 11 out of 206; mounted police, 5 out of 80; firemen, 5 out of 20; coolies, 102 out of 550; cooks, 4 out of 60; ambulance parties, 69 out of 150; soldiers, 63 out of 1,100; total, 297 out of 2,943.

In South Manchuria the plague sanitary corps suffered a loss of 122 persons, among whom were one Japanese, one English, and forty Chinese physicians. This represents 2.66 per cent. of the total plague mortality in the districts concerned.

The presumption is that all the members of the sanitary corps wore masks. The masks were, however, not worn constantly nor were they always properly adjusted; coolies were often seen with the masks hanging around their necks instead of being over their mouths. Hence the high death-rate of the sanitary staff cannot be regarded as proof of the inefficiency of masks.

In Mukden the mask which was almost universally employed consisted of a pad of absorbent cotton about 16 by 12 cm. and about 1.5 cm. thick; this was wrapped in gauze, the ends of which were tied at the back of the head. A many-tailed bandage composed of three layers of gauze with holes for the eyes was tied around the entire head, and served to press the mask firmly against the face and keep it snugly in place for hours at a time. When first put on, this mask was decidedly uncomfortable, but after a few minutes one became somewhat accustomed to it, and could wear it for two or three hours at a time. There was, however, always an intense feeling of relief on removing it. This type of mask is designated in the discussion to follow as the "Mukden mask."

The following experiments were undertaken with the idea of determining whether this Mukden mask is, in fact, an efficient barrier against the passage of plague bacilli into the lungs and, also, whether or not other types of masks are more efficient.

At the International Plague Conference held in Mukden in April, 1911, Broquet, the French delegate, demonstrated a mask "copied from those used by doctors in the epidemic of the fourteenth century as shown in old books." It consisted of a hood of light canvas or khaki cloth, covering the entire head and drawn in at the neck. In front was a window of mica. No experiments had been performed to test the efficacy of this mask. We shall refer to this type of mask hereafter as the "Broquet mask." It was not used during the recent epidemic of pneumonic plague in Manchuria with the exception of a few times by Broquet himself.

Preliminary tests indicated that a hood of heavy Canton flannel with a nap was more effective in holding back *B. prodigiosus* than hoods of lighter cloth such as the one demonstrated by Broquet. Instead of mica for the window, Barber and Teague used sheet celloidon such as one sees in the storm curtains of automobiles. The hood was made narrow at the neck so that it would spread out over the shoulders and could be drawn in and tied snugly around the neck. Comparative experiments were made with this mask and the Mukden mask; the subjects wearing the two masks were forced to breathe air containing *B. prodigiosus* simultaneously for the same length of time.

B. prodigiosus was selected for the experiments as being entirely harmless and easily recognizable on account of its pigment production. An ordinary throat atomizer was used for making the spray, but with the idea of getting smaller droplets the rubber bulb was removed and a stronger air blast was obtained by using an automobile pump.

Special precautions were taken to avoid accidental contamination with *B. prodigiosus* on removing the mask. The subject was clothed in an operating gown and, in the case of the Mukden mask, his head was covered with a cloth and the eyes protected by automobile goggles. The spraying was generally done in a small, single-roomed stable, which was boarded up on all sides to keep out the

* *Philippine Journal of Science*, Section B., vol. vii, No. 3, June, 1912.

light and to avoid, to a certain extent, currents of air. The gowns, goggles, and head-cloths were removed after the subjects had left the stable and before they entered the laboratory building. One of the authors attended to the spraying and exposure of the subjects, the other endeavoured to keep himself and his laboratory room free from *B. prodigiosus* and made the necessary plate cultures in order to determine the result of the test. At first the saliva, taken before and after the spraying, was smeared over agar plates, but later it was found that small pieces of moistened cotton, placed in the nostrils and before the mouth (underneath the Mukden mask), rendered the test much more delicate.

Agar plates were exposed during the course of the experiment in order to obtain an indication of the *living B. prodigiosus* that were in the air around the mask at the time.

Experiments showed that neither the Mukden mask nor the heavy Canton flannel Broquet mask is able to hold back completely *B. prodigiosus* when they are sprayed in large numbers continuously for a period of three minutes about the heads of the subjects. As this Broquet mask is the most efficient of all the masks with which we have experimented, it follows that none of our masks can withstand this test. The fact that the moist cotton from the centre of the Mukden mask contained many *B. prodigiosus* shows that some of the *B. prodigiosus* passed directly through the mask; or, in other words, that the inefficiency of this mask is not due solely to the fact that the bacilli pass around the edges of the cotton pad or through the free spaces at the sides of the nose which were, perhaps, only imperfectly plugged with cotton. In this experiment the masks were subjected to a much more severe test than would occur in practice; nevertheless, it presents conclusive evidence, we believe, that these masks do not offer absolute protection against infection with pneumonic plague.

In another series of experiments, three minutes after spraying had been stopped, Canton flannel Broquet mask subject and Mukden mask subject were taken into room and allowed to remain for ten minutes. Living *B. prodigiosus* were very numerous at the beginning of the test, but decreased very rapidly during the ten minutes that the subjects were exposed. This must be regarded also as a very severe test, though by no means so severe as the preceding one. The Broquet mask withstood the tests, while the Mukden mask failed to hold back all the *B. prodigiosus*. This experiment, therefore, demonstrates clearly the superiority of the Broquet mask over the Mukden mask.

In a third series, the two subjects entered the room six minutes after stoppage of spraying, and remained in for ten minutes. This test was an extremely light one. A Petri dish exposed during the first three minutes that the masked subjects were in the room developed only 280 *B. prodigiosus* colonies, and another, during the last three minutes, only twenty-nine colonies. In spite of the small number of living *B. prodigiosus* that were in the air, the Mukden mask failed to hold back all of them. We are inclined to believe that this test is even a less severe one than that to which the masks were subjected during the recent plague epidemic in Manchuria, as the coughing patients in the crowded wards must have been throwing out hundreds of fine droplets almost continuously and, on account of the low temperature, the plague bacilli in these droplets must have remained suspended in the air in a viable condition for a considerable period of time. Since we have found repeatedly in tests which were not severe that the Mukden mask allowed bacilli to pass, we are forced to the conclusion that the sense of security felt by those who wore this mask in the Manchurian epidemic was not justified.

Experiments were carried out in a cold-storage room measuring about 2.5 by 3 metres at a temperature of 12° C. A 24-hour agar culture of *B. prodigiosus* was suspended in about 40 c.c. of 0.5 per cent. sodium chloride solution and filtered twice through cotton. A portion of this suspension was sprayed by means of a throat atomizer connected by rubber tubing with a two-cylinder force pump, such as is used in filling automobile tyres. The spraying was continued for a period of two minutes, the spray being directed toward all portions of the room. The pump was then removed and the door of the cold room quickly closed. A period of two hours was allowed to elapse, and then the three masked boys were hurried into the room and the door was closed behind them. They remained ten minutes in the room. During this time each held in his hand an open Petri dish containing solidified agar and closed it immediately after leaving the cold room.

Boy No. 1 wore a Mukden mask, boy No. 2 our Canton flannel Broquet mask. The usual measures against accidental contamination with *B. prodigiosus* were adopted. Boy No. 3 wore a mask of wet gauze. Strips of gauze were boiled and while still warm were squeezed out and applied loosely over the lower portion of the face from the eyes to below the chin. The gauze was not in layers, but was placed irregularly as in surgical dressings which are intended to absorb pus. A many-tailed bandage with holes for the eyes, such as is used with the Mukden mask, pressed the moist gauze firmly against the face and held it snugly in place. This mask was about five or six centimetres thick over the mouth and became thinner toward the edges. Goggles were worn by this boy also and the top of his head was covered with a cloth reaching down to the mask.

In spite of the long interval (two hours) which elapsed between the spraying and the exposure of the subjects, this test must be regarded as a very severe one, for the plates show that numerous living *B. prodigiosus* still remained suspended in the air at the time of the exposure. Furthermore, the number of living bacilli in the air in the cold room remained practically constant during the ten minutes of the test, while in the second series of

experiments carried out in a warm stable there was a rapid decrease. This experiment shows again the superiority of the Broquet mask over the Mukden mask. It also proves that *B. prodigiosus* may pass directly through the cotton pad of the Mukden mask, for a piece of moist cotton placed near the centre of the pad contained *B. prodigiosus* after the test. The mask of wet gauze also failed to hold back all the bacilli, and is hence inferior to our Broquet mask. The experiment does not afford any evidence as to the relative efficiency of the Mukden mask and the mask of moist gauze.

Experiment No. 5.—March 1, 1912. The mouth of one of the authors was rinsed with sterile salt solution and then about 10 c.c. of saliva were collected in a sterile test tube. One slant of a fresh prodigiosus culture was suspended in this saliva. The resulting suspension was thoroughly shaken and then taken a little at a time into the mouth and made into a spray by being blown between the lips. The spraying was done in a cold storage room at 9° C. The room was then kept closed for one hour, when the three masked subjects were quickly taken in and the door closed behind them. They remained inside ten minutes, each subject holding during that time an open Petri dish of solidified agar.

The masks were removed and cultures made as in the preceding experiment.

This experiment was designed to approximate more nearly to the conditions that occurred in Manchuria. It seemed possible that the viscid sputum of pneumonic plague might form larger droplets than the salt solution of our experiments and on that account be unable to pass through the masks. Preliminary tests were made by taking *B. prodigiosus* into the mouth and then holding Petri dishes containing solidified agar immediately before the mouth while talking or coughing. It was found that under these conditions *B. prodigiosus* were emitted in too small numbers and too inconstantly for the method to be satisfactory in testing our masks. Swabbing the vocal cords with the bacilli might have given satisfactory results, but this was not tried. Instead of this, it was decided to blow saliva containing *B. prodigiosus* between the lips, thus converting it into a spray. The droplets of saliva produced in this way apparently passed through the masks as readily as the salt solution droplets from the atomizer. This experiment furnishes strong evidence that droplets of sputum from pneumonic plague patients may be able to pass through the Mukden mask.

General Discussion.—The protocols which have been cited could be supplemented by numerous others giving similar results.

While these experiments furnish evidence that fine droplets of sputum of patients suffering from pneumonic plague may pass through the mask that was so widely used in Manchuria, yet they do not at all indicate that this mask was entirely without value. Obviously, the mask would hold back gross visible particles of sputum which are sometimes thrown out in coughing. Moreover, in our experiments, when *B. prodigiosus* were recovered from the nostrils, it is probable that in the same test without the mask far greater numbers would have entered; in other words, it seems probable that great numbers of bacteria that otherwise would have entered the nose and mouth, remain on the surface of the mask and in its substance.

Hence we believe that masks should be worn by those attending pneumonic plague patients, but that they should not be regarded as affording absolute protection against infection; bearing this in mind: even when masked, one should remain in the near vicinity of the patient only so long as is necessary for the work in question.

Conclusions.

(1) The "Mukden mask" in general use during the epidemic of pneumonic plague in Manchuria, during the winter of 1910 to 1911, does not prevent the passage into the mouth and nostrils of *B. prodigiosus* when contained in small droplets sprayed around the mask. This mask consists of a pad of absorbent cotton held over the mouth and nose by a many-tailed gauze bandage.

(2) A hood of heavy Canton flannel cloth, covering the entire head and tied in snugly at the neck, withstands much severer tests than does the Mukden mask. It does not, however, offer an absolute barrier to the passage of *B. prodigiosus* into the mouth and nostrils of the subject. This mask, with a window in front, is not more inconvenient nor more uncomfortable than the Mukden mask.

(3) It is shown that the inefficiency of the Mukden mask is not due solely to the fact that the mask fails to conform to the configuration of the face, but that the bacteria may pass directly through the mask; for a piece of moist cotton placed in the centre of the mask was found after the test to contain *B. prodigiosus*.

(4) It is believed that, although masks hold back many bacteria that would otherwise pass into the mouth and nostrils, nevertheless their use during the recent epidemic of pneumonic plague in Manchuria lent a *false* sense of security which may have led to the taking of unnecessary risks. We believe that these experiments fully justify the conclusion that masks such as were used in that epidemic do not offer an absolute protection against pneumonic plague.

[We desire to make due acknowledgment for the lengthy abstracts here given, and to congratulate the authors on the interest and importance of their work. The studies on pneumonic plague contained in this number of the *Philippine Journal of Science* form a contribution of great value to our knowledge of this important disease and contain much that is quite new. The new data here given to medical science make but a small part of the whole report, which will remain as a classic for all future students of plague.—H. M. H.]

Annotations.

The Health of the Canal Zone.—Phillips, Acting-Chief Sanitary Officer of the Canal Zone, in submitting his report of the Department of Sanitation for the month of January, 1913, states that the total number of deaths from all causes among employees was 51, divided as follows: Disease 32, and violence 19, giving the annual average per thousand of 7.37 and 4.37 respectively.

Among employees for the month of January of each year the annual average death-rate per thousand was as follows:—

1905, 15.40; 1906, 40.93; 1907, 25.62; 1908, 12.72; 1909, 10.98; 1910, 10.57; 1911, 10.14; 1912, 8.10; 1913, 11.74.

The annual average death-rate per thousand in the cities of Panama and Colon, and the Canal Zone, including both employees and civil population for the month of January of each year, was as follows:—

1905, 46.55; 1906, 47.70; 1907, 35.12; 1908, 26.66; 1909, 22.86; 1910, 21.26; 1911, 21.05; 1912, 17.67; 1913, 23.24.

In segregating according to race, the annual average death-rate per thousand from disease among employees was: For whites 3.82, and for blacks 8.49, giving a general average for disease of 7.37. For the same month during 1911, the annual average death-rate per thousand from disease among whites was 1.89, and blacks 6.23, giving a general average of 5.07; and in 1912 from disease among whites 7.57, and blacks 3.98, giving a general average of 4.86.

Among employees during the month, deaths from the principal diseases were as follows: Hæmoglobinuric fever, 2; lobar pneumonia, 5; malaria fever, E. A., 2; organic disease of the heart, 2; tuberculosis, 8; typhoid fever, 1; leaving 12 deaths from all other diseases, and 19 deaths from external violence.

No cases of yellow fever, small-pox, or plague originated on or were brought to the Isthmus during the month.

Notes and News.

LONDON SCHOOL OF TROPICAL MEDICINE.

EXAMINATION RESULTS (FORTY-FIRST SESSION, JANUARY-APRIL, 1913).

G. P. G. Beckett, M.D., B.Ch., B.A.O., L.M.Dub. (Colonial Service).
D. Birt, M.B., B.S.Durham (Colonial Service).
J. R. Boyd, M.B., Ch.B.Edin. (Colonial Service).
Capt. F. P. Connor, F.R.C.S.Eng., with distinction.
F. C. Doble, M.R.C.S., L.R.C.P. (Colonial Service).
M. C. F. Easmon, M.B., B.S.Lond., M.R.C.S., L.R.C.P.
Capt. C. A. Gill, I.M.S., M.R.C.S., L.R.C.P., D.P.H., with distinction.
Major J. A. Hamilton, I.M.S., M.B., F.R.C.S.E.
Miss F. M. Harper, M.B., B.Ch.Edin., D.P.H. Camb.
Miss C. L. Houlton, M.B., B.S.Lond.
Miss E. M. Layman, M.B., B.S. Lond. (Colonial Service).
W. E. Lewis, M.B., Ch.B.Edin. (Colonial Service).
Miss J. McDonald, M.B. (Toronto), M.R.C.S.Eng.
Miss L. S. McLean, M.B., Ch.B. (Colonial Service).
W. T. P. Meade-King, M.R.C.S., L.R.C.P. (Colonial Service).
J. F. H. Morgan, M.R.C.S., L.R.C.P. (Colonial Service).
F. W. O'Connor, M.R.C.S., L.R.C.P.
Miss S. O'Flynn, M.B., Ch.B.Edin.
A. P. Watkins, M.R.C.S., L.R.C.P. (Foreign Office).

THE UNIVERSITY OF LIVERPOOL.

EXAMINATION LISTS, APRIL, 1913.

Faculty of Medicine.

Diploma in Tropical Medicine.—J. G. Becker, C. Forsyth, M. C. R. Grahame, K. K. Grieve, A. R. Hargreaves, P. Hiranand, O. E. Jackson, M. MacKelvie, J. McP. MacKinnon, R. J. A. Macmillan, C. E. F. Mouat-Biggs, E. Olubomi-Beckley, D. S. Puttanna, J. H. Reford, F. D. Walker, U. B. Yin, W. A. Young.

Review.

LESSONS ON ELEMENTARY HYGIENE AND SANITATION WITH SPECIAL REFERENCE TO THE TROPICS. By W. J. Prout, C.M.G., M.B., C.M.Edin., Medical Adviser to the Colonial Office, &c. Third Edition. Sixth Thousand. London: J. and A. Churchill, 7, Great Marlborough Street 1913.

This useful little manual on elementary hygiene and sanitation has now reached a third edition. That it should have done so indicates how valuable and popular it has been. The present edition runs to 184 pages, and has been brought thoroughly up to date. It is divided up into fourteen lessons, with a note on personal hygiene and a conclusion containing a summary of what has been learned in the different lessons. Its aim is to form an elementary text-book for the use of schools in the Tropics, and for this purpose it has rightly succeeded.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

THE EFFECT OF DRAINAGE ON HEALTH IN THE CITY OF NEW ORLEANS; A STATISTICAL STUDY.*

By J. Birney Guthrie, M.D.,

Professor of Clinical Medicine, Tulane University of Louisiana.

(Studies from the Laboratories of Tropical Medicine and Hygiene, under the direction of Creighton Wellman, Tulane University of Louisiana, No. 32.)

The city of New Orleans has been through a greater variety of experiences in regard to health matters than any other city on this Continent. Settled in 1718 on a narrow strip of alluvial land along the bank of the Mississippi, lying in the midst of a cypress swamp, and subject to yearly overflow until 1728, when the first levees were constructed, the city was the centre of a large commerce with Europe and with the Tropics. With no maritime sanitary regulations, it was little wonder that epidemic diseases of temperate and tropical countries obtained a foothold here from time to time. During several years of the last century both Asiatic cholera and yellow fever occurred simultaneously and produced a mortality frightful to contemplate. The year 1832 furnished the most striking instance, in which year the death-rate mounted to 147 per thousand, exceeding one out of every seven of the city's population. The period of the city's greatest growth, 1830 to 1860, was marked by its two severest epidemics. This is not surprising when one takes into account the large number of persons non-immune to yellow fever who had come in from other states. Yellow fever was considered endemic.

Sanitary maritime regulations involving inspection of vessels at tropical ports of sailing, together with close scrutiny of crew and passengers at the mouth of the river, and mosquito destruction on ships, have made the introduction of yellow fever extremely unlikely; but it will always be a source of anxiety and labour until all the tropical Americas are free from it. However, the measure whereon the safety from epidemics rests, the ridding premises of small collections of water, is one of the phases of drainage—a problem of mosquito destruction solved alike in Havana, New Orleans, and Panama. The introduction into New Orleans of a case of yellow fever would cause no panic and no epidemic; for the greater part of the breeding places of *Stegomyia* have either been destroyed or rendered harmless through screening. If we leave out of consideration artificial inoculation of actual blood, there is no means of transmitting the disease known to science, except by the bite of this insect after having bitten a person sick with yellow fever.

In consequence of these variations in health conditions, and in consequence, perhaps, of a lack of frankness in times past, New Orleans has suffered, and indeed still suffers, from a misapprehension regarding its health conditions on the part of the people of the United States. Fortunately the root of the evil has been eliminated by the expenditure here of twenty millions of dollars on drainage, sewerage, and water supply during the past twelve years. The necessity of perfect honesty in the matter of notification of the existence of infectious disease is generally conceded. The business community and those in authority are now thoroughly alive to the importance of a policy of absolute frankness in all health matters. To-day New Orleans is in a position to court investigation of its health conditions; and to-day no one need look forward with apprehension to a visit of any length to New Orleans at any season of the year. It is to be hoped that these facts will become generally known, and that the knowledge will serve to remove the existing handicap.

In addition to the mosquito-borne disease, yellow fever, there has existed from the earliest times in New Orleans another scourge of low-lying lands likewise dependent for its propagation on a particular mosquito carrier—malaria. Formerly the entire population suffered from some form of malarial infection, and the mortality from this cause was enormous. Men now living and practising medicine tell of the most pernicious forms of the disease originating within the city's built-up district. Every settlement in a swampy area as it increases in population shows a diminishing death-rate from malaria. This results from drainage put in to make possible the paving of roadways, which cannot be maintained without drainage. The same is true of agricultural districts, but to a less extent. Here the chief factor in stimulating drainage operations is the cultivation of lands. This cultivation is possible only after making provision for carrying off water. When the lands are put under the plough evaporation is very much increased, and the amount of standing water still further reduced.

Such drainage as had been done in New Orleans incidental to the maintaining of roadways open to traffic had, even up to 1900, materially improved health conditions; but the greater part of the task was still undone. The problem has been peculiarly difficult. The area of the city is 196 square miles, and of this only 41 square miles are improved. The yearly rainfall is about fifty inches. Downpours of more than six inches in a single afternoon are a matter of record. The surface of the ground is flat, and the difference in level but slight, the highest point being fifteen feet above the mean gulf level, and the lowest one foot below. It becomes necessary, therefore, in order to get rid of the rainfall in anything like a reasonable time, to establish an artificial system with a gradual and uninterrupted fall to the main outflow canals. From these the water must be pumped up to the sea level again and discharged. The varying height of the Mississippi (from mean gulf level to twenty feet above mean gulf level) makes it impossible to use the river to carry off the rainfall without enormous operating expense for pumping. Hence, Lake Pontchartrain, which is practically always at sea level, has been utilized for the drainage outlets, and the average lift in outlets is fifteen feet, decreasing to ten feet during storms.

* A paper read before the Second National Drainage Congress.

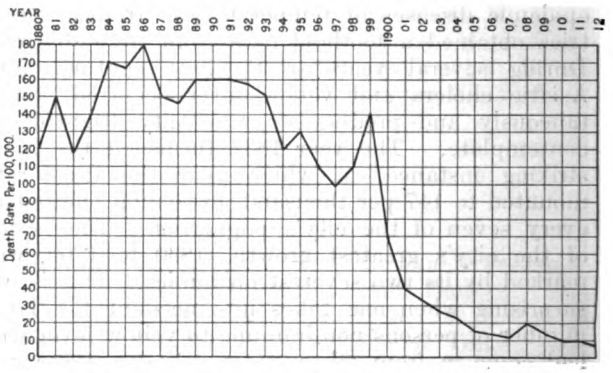
On the other hand, it would be most unwise from a sanitary standpoint to use the lake to receive the sewage of the city, and the river becomes the only possible outlet for the contaminated waste water. A second system, therefore, has been installed for this, lying at a greater average depth than the drains proper, with the main sewer emptying into the Mississippi. The main sewer lies at about twenty-four feet below sea level, and the average resultant lift, including friction in the outflow pipe, is thirty-five feet. This is increased during periods of high water to fifty-five feet. Actually one-third of the total rainfall of the city finds its outlet through the sewer system proper.

The system of drainage was set in operation in 1900, and the sewer system in 1906. It should not be thought that before this there was no provision for taking care of the storm water, as this was not the case; but the fall in the then existing system was inadequate, and the pumps were insufficient to get rid of a heavy volume of water in a reasonable time. Large areas lacked proper connection with the drainage canals, and floods were exceedingly frequent. Water stood in sheets in certain districts for days, and even weeks at a time, disappearing either by slowly oozing through a rather impervious soil, by evaporation (likewise a slow process), or by flowing over the surface to the nearest available outlet. To-day local floods occur in certain districts in which there has been delay in construction of the secondary drains, or after extraordinary downpours. Visible standing water is becoming a rare sight.

The general death-rate in New Orleans during 1890 to 1899 was 28; that of the following decade, 1900 to 1909, 21.5, the computation being on the basis of United States census returns, adding each year 10 per cent. of the ten-year increase of population. These figures were computed by Mr. George Earl, Superintendent of the Sewerage and Water Board (to whom I am indebted for the above data regarding the present drainage system), and include both white and coloured population, and deaths of non-residents occurring in Charity Hospital. In considering these figures, we must bear in mind that New Orleans has about one hundred thousand negroes, and that this element in the population maintains a death-rate about 40 to 50 per cent. higher than the whites. If it were not for this "white man's burden" of ignorance and superstition and shiftlessness, the showing would be better; for the white population, including deaths in Charity Hospital, gives a death-rate of 18.3 per cent., less than the average of American cities in general. The charted curve of mortality rates in New Orleans took a rather sudden drop in 1900, the year the drainage system proper was put in operation, and it has been steadily declining ever since.

Students of sanitary conditions lay it down as a principle that the improvement of drainage conditions brings about a diminution in malaria and in respiratory diseases. In order to study the effects on mortality rates under these conditions, the writer undertook a study of the mortality statistics of pneumonia, of tuberculosis, and of malaria in New Orleans for a period of thirty-two years, 1880 to 1911 inclusive, computing the death-rate on the basis of United States census reports, adding each year one-tenth of the ten-year increase. The death-rate was computed for the period before the installation of the drainage system proper, 1880 to 1899, and compared with the period, 1900 to 1911, since the drainage installation. This latter period was further subdivided at the year 1906, when the sewerage system was set in operation and the five-year period, 1900 to 1905, was compared with the seven-year period, 1906 to 1911. There was no appreciable diminution to be noted in the figures representing mortality from pneumonia and tuberculosis, and the tabulations are not included in this paper; but those representing the malaria mortality are most striking.

The decade, 1880 to 1889, gives a mean mortality from all forms of malaria of 149.8, with the



Curve of Death rate from Malaria in City of New Orleans—33 years, 1880 to 1912—Based on Estimated Population from U.S. Census, adding each year 10 per cent. of ten years' Increase.

maximum for thirty-two years of 180 per one hundred thousand occurring in 1886.

The decade, 1890 to 1899, shows a mean malaria mortality of 125.5 per one hundred thousand.

The twelve-year period, 1900 to 1911, shows 23.3 per one hundred thousand.

The first five years of the drainage period, 1900 to 1905, after the installation of the drainage system proper and before the installation of the sewerage system, give a mortality of 37.8 per one hundred thousand.

In the seven years, 1906 to 1911, during which time both systems have been in operation, the mean mortality per one hundred thousand is 13, and the smallest death-rate from malaria in thirty-two years occurs both in 1910 and 1911, namely, 9 per one hundred thousand, a diminution from the maximum of 180 in 1886 of exactly 2,000 per cent. The recently published statistics for 1912 show that the malaria death-rate for last year is even less than for the two preceding years—viz., 8.3 per one hundred thousand.

The morbidity from malaria could be studied only in the reports of the Charity Hospital, and by com-

munication with physicians whose experience extended into both periods. The records of total admissions to the Charity Hospital with diagnosis of malaria in any form were compared for two five-year periods, 1895 to 1899 (previous to the installation of the present drainage system) and 1906 to 1910 (subsequent to the operation of both drainage and sewerage systems). For the first period, 1895 to 1899, there were 6,369 patients with diagnosis of malaria admitted out of a total of 39,434 admissions, making 16.9 per cent. For the second period, 1906 to 1910, there were 1,893 patients diagnosed as malarial out of a total number of admissions of 47,731, or 3.9 per cent. Here we find a diminution of 15 per cent. in morbidity in the second period (after the operation of combined drainage and sewerage system) as compared with the first period (previous to the installation of the present drainage system).

The writer is aware that the above mortality and morbidity figures are subject to errors of diagnosis. It is probable that errors have occurred, but such errors would not be sufficiently great to make the statistics valueless, especially as they coincide with the conclusions of numerous individuals who have had the matter under uninterrupted observation.

The writer has always lived in New Orleans, and during the last fourteen years has continually followed the practice of examining the blood of such patients as came under his charge with symptoms pointing at all to the existence of malarial infection, so that such errors as are above mentioned are, to a certain extent, minimized in his own experience. It is his opinion that malarial infection in New Orleans has almost ceased to exist. The only cases he has seen during the last two years, which had not received infection elsewhere, were among dairymen living on the outskirts of the city or among labourers along the docks during a low stage of the river. These were all simple tertian infections. This experience is corroborated by his colleagues, Professors Elliott, Bass, Lemann and Weis, of the Department of Medicine of Tulane University of Louisiana, who in personal communications agree with him in the view that the cases which they see now in which death occurs from malaria are cases infected elsewhere. Doctor Joseph Holt, a clinician of long experience, also confirms the above opinion. Fatal types of malaria have ceased to exist in New Orleans; very little of any type is to be seen at present, and none at all in the districts drained, sewered, and paved. The reason is that anopheline mosquitoes have been banished from all but the outskirts.

It is a victory won by drainage over disease. It may be difficult to classify exactly the part played by the work done in the rural districts of Louisiana and of other Southern States which send their sick to New Orleans to be treated, and the part played by the operations in the city of New Orleans itself; but from a sanitary standpoint the conclusion is obvious that the results have been achieved by getting rid of the breeding places of that species of anopheline mosquitoes which alone can transmit the infection from one person to another.

What has been done in New Orleans can be done in the rural districts of Louisiana, Mississippi, and Alabama. The laws of Louisiana are now so framed that a drainage district for the issuance of bonds can be readily formed and drainage operations perfected. The present faulty drainage systems in comparatively extensive areas lying along the Mississippi River and its tributaries, and the malarial conditions resulting therefrom, are due in a measure to the blocking of the various small streams which would normally flow into these rivers. The blocking of these streams has been done at the point of their entrance into the larger river. This has been incidental to the construction of levees along the main streams, as it is impossible to construct a system of levees along both banks of all these minor streams. The burden of the maintenance of the levee system along the larger streams has been very great in itself, and drainage has been sacrificed to economy.

In closing let me make a plea for drainage primarily instituted for sanitary purposes, then health and immigration will come to the districts so drained, and capital will come to develop the richest lands on our continent.

THE TREATMENT OF SUPPRESSION IN BLACKWATER FEVER.

By Hugh Stannus Stannus, M.D.(Lond.),
Zomba, Nyassaland.

Some eight years ago, when I was face to face with my first case of blackwater fever in which the urine measurement was small, I puzzled over the probable cause of suppression, and came to the conclusion that blocking of the kidney tubules was the only reasonable explanation.

Having a short time previously seen a case of acute nephritis with suppression operated on under the mistaken diagnosis of calculus suppression, with nothing but good results, I wondered whether relief of tension in the kidney in the suppression of blackwater fever by nephrotomy would be beneficial.

Since then double nephrotomy has been performed actually for the suppression of acute nephritis, and operative intervention has been, I believe, advocated in blackwater suppression by one author to whose paper I cannot at the moment find reference. The pathological conditions underlying the suppression of blackwater fever have now been demonstrated by Barratt and Yorke and others, and the prophylactic treatment of suppression by flushing the kidneys, which one had carried out before empirically, has now been put upon a rational basis.

It still appeared to me that where suppression had occurred, the tubules being blocked and distended by *débris*, with strangulation of the kidney within its capsule, treatment by incision, as has been done in acute nephritis, would be the correct

procedure, but until the present time no case had come under my care actually with suppression, means for prevention of its onset having always succeeded. I have never seen any case reported in which surgical means had been adopted for the treatment of blackwater suppression, and for reasons which are mentioned later I have thought it worth while to publish the single case detailed below. It will be recognized that my remarks are only intended to deal with cases of acute suppression in the early stages of the disease, and not with that occurring later on.

M., male, aged 25, a planter, was admitted to hospital at 11.30 a.m. on November 3, 1912, with a history of "blackwater" commencing twenty-two hours before. He had travelled some 25 miles in a hammock, and had not passed water for two or three hours before admission.

Interrogation elicited the following history: Patient returned from England to a cotton estate on the Shiré River nine months ago, and during this period had been in the habit of taking 10 gr. of quinine sulphate, in tabloid form, each Wednesday and Thursday. About a month before the present illness, however, he had an attack of "fever," but did not take any extra quinine. Patient had never had blackwater fever before and was of very temperate habits, being a teetotaler and non-smoker.

The onset of the "blackwater" was on a Saturday; on the previous Wednesday and Thursday he had taken his usual quinine, on the Friday he was very well, but on Saturday at noon he felt ill and feverish, and took 10 gr. of phenacetin, followed an hour later by 10 gr. of quinine sulphate in tabloid form. Half an hour later "blackwater" appeared, accompanied by rigor, vomiting and diarrhœa.

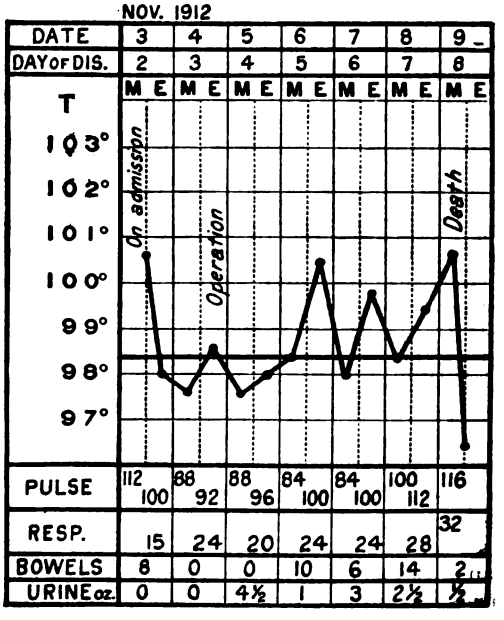
The patient was a man of good physique, with no signs of organic disease, icterus fairly marked. The spleen not palpable, the heart not dilated but sounds rather of a tic-tac type. Pulse, 108 per minute. Temperature, 100.6° F. Respirations, 15 per minute. A catheter passed did not draw off a single drop of urine. During the next twenty-four hours vomiting and diarrhœa were very troublesome, but were much relieved by a mustard leaf to the epigastrium, and starch and opium enemata. Eight ounces water containing 30 gr. sodium bicarbonate were given every hour by the mouth, saline under the skin, cupping over the loins and digitalis, but no urine appeared in the bladder. I, therefore, with the patient's permission, decided to operate before his condition was any worse. A wire to my nearest medical assistance found the medical officer away, but later in the day, on his return to his station, it was promptly responded to by Dr. Eldred, to whom my best thanks are due. Having travelled 100 miles, he administered chloroform at 9 p.m. on the 4th inst., and having exposed the left kidney by the usual loin route and freed it from the surrounding capsule, I incised the capsule from pole to pole, and the bulging purple grey organ was then incised through the middle two-thirds of its free edge; bleeding was not very free at first. Gauze plugs were led down to the bed of the kidney, and to the unsutured wound, dressings were applied.

On return to bed the patient's condition was satisfactory, though later in the night restlessness necessitated the use of a hypodermic injection of ¼ gr. of morphine given with digitalein.

On the following day (November 5) it was found that there had been free oozing from the wound, and some 12 oz. of dark-brown fluid containing brown colouring matter were withdrawn from the bladder.

General condition of patient good, comfortable, and without any distressing symptoms; perspiration free.

During the remaining three and a half days small amounts of urine were passed naturally or drawn off by catheter (see chart), but the general condition progressed unfavourably.



There was some œdema of the face, and flatulence with abdominal distension and hiccough were also troublesome; diarrhœa recommenced and temperature rose again, while the heart showed increasing signs of failure. Symptomatic treatment and intravenous saline injections were then given.

On the 9th inst. there were a number of uræmic seizures, followed by coma and death.

On admission, and subsequently, no malarial or other parasites were found in the peripheral blood.

The principal facts of the case are hæmoglobinuria for twenty hours, followed by complete suppression for forty-eight hours; nephrotomy (unilateral) performed, followed by the passage of small amounts of urine beginning within twenty-four hours of operation, and going on until death, with symptoms of urænia on the morning of the fifth day after operation.

Though I have seen no case of suppression before in my own practice there have been a number of

such cases in this country, and, as far as I can ascertain, complete suppression has always been followed by a fatal termination, and the restoration of the functions of the kidneys has never been seen.

In the above-mentioned case it would appear that some slight degree of restoration of function did take place, and that such was due to the relief of pressure within the kidney by nephrotomy.

Is it possible that operation at an earlier period in the suppression would have been successful in saving life? I think very possibly. The difficulty which naturally presents itself is to know at what hour surgical interference should be considered. How long may suppression last to be followed by restoration of kidney function in these cases?

If a fatal termination were found in every case of suppression untreated by operation, then the use of a catheter might determine an early surgical interference.

Is there a definite, or more or less definite, period for which suppression may last and be followed in a large proportion of cases by restoration of renal function?

If such exists, then it would constitute valuable information in deciding when to seek surgical aid.

These are questions which I cannot answer, as I am not in the possession of sufficient data and have no access to them, but it is with the hope of eliciting them from others that I venture to publish this single incomplete and unsuccessful case.

SPIDER'S WEB AND MALARIA.

By Frederick Knab,

U.S. Bureau of Entomology, Washington, D.C.

Under the above caption Colonel M. D. O'Connell, in the *Journal of the Royal Army Medical Corps*, vol. xix, 1912, pp. 491-493, pleads for the web-making spiders as effective destroyers of malaria-transmitting mosquitoes. It has been generally taken for granted that mosquitoes are entangled in spider-webs, just as are other diptera, and the colonel's observation supports this view. It is far from the writer's purpose to discredit the spiders, and undoubtedly mosquitoes are sometimes their prey. Many references to the supposed efficiency of spiders as mosquito destroyers occur in economic mosquito literature; yet these do not give the impression of being first hand. Records based upon actual observation seem to be exceedingly few. In fact, there are more actual observations directly at variance with the generally accepted idea than in agreement with it. As the writer has already shown in a previous paper, mosquitoes (as well as certain other species of diptera belonging to the group Nemocera) have been observed to choose spider-webs as a resting-place and to habitually repose there.* In every case the mosquitoes so observed have been *Anopheles*. During the past season the writer was able to confirm these observations and determine an additional point. As the records in question are probably not generally known, or not accessible to the readers of this Journal, it may be permissible to repeat them for the sake of clearness.

The earliest observations seem to be those of Doctors Sambon and Low, and are recorded in their account of the famous malaria experiment in the Roman Campagna in 1900.† "The fully-developed *Anopheles claviger* [*A. maculipennis*] was found in great numbers in the houses, stables, and hen-houses, frequently resting on cobwebs." Theobald, in the third volume of his "Monograph of the Culicidæ," 1903, p. 4, makes the following statement: "Generally speaking, it is not usual to find gnats or midges thus caught; indeed, they may be seen to settle on them and to fly away again."

In North America, Mr. W. L. McAtee, in June, 1911, while at Big Lake, Arkansas, observed *Anopheles* resting in numbers on a spider's web. "On a rainy day a large number of *Anopheles quadrimaculatus* were found sitting on a spider-web in a hollow tree. Thinking they must be at least slightly entangled, I counted on capturing them easily. Upon putting my cyanide bottle near one the whole swarm rose lightly on the wing, not sticking to the web at all. By further tests I found they were perfectly at home on the web."‡

The writer's observations were made during the past season in the vicinity of the city of Washington. Having found that a variety of nemocerous diptera frequent spider-webs and habitually rest on them, he made further investigations. A suitable locality was found along the banks of the Potomac—well-wooded, damp, and with numerous rocks, where spider-webs abounded on the overhanging rock-surfaces and between the crevices. The majority of the diptera frequenting the webs were *Cecidomyidæ*, and these were sometimes present literally in hundreds; second in abundance were certain *Tipulidæ*, and finally there were *Anopheles* of both sexes. Most remarkable was the fact that all the *Anopheles* observed on the webs belonged to one species, *Anopheles quadrimaculatus*, although a second species, *A. punctipennis*, was present in that locality in larger numbers. This latter species was found resting on the under surfaces of overhanging rocks and other shelters, but it carefully avoided the webs. The former, on the contrary, was always on the webs.

Now *A. quadrimaculatus*, the species which frequents the webs, is the North American representative of the European *A. maculipennis;* indeed, by many it is considered identical. In the northern United States *A. quadrimaculatus* is the principal malaria transmitter, and over a large area practically the only one. The more abundant *A. punctipennis* has been proved incapable of serving as the host of the malarial parasites. The form

* "Diptera at Home on Spiders' Webs." *Journ. N.Y. Ent. Soc.*, vol. xx, 1912, pp. 143-146.

† "The Malaria Experiments in the Campagna." *Brit. Med. Journ.*, vol. ii for 1900, pp. 1679-1682.

‡ *Proc. Ent. Soc. Wash.*, vol. xiii, 1911, p. 193.

found on the webs in Italy by Sambon and Low was *A. maculipennis*, the principal malaria-transmitter in that region. Thus it appears that in some cases at least the spider-webs have no effect in checking malaria.

It is, of course, possible that in other parts of the world other species of *Anopheles* are caught in spider-webs; but, if so, this has not yet been shown. In fact, it has not been possible to find a single record of *Anopheles* caught in a web. These statements must not induce us to condemn spiders as a whole as altogether useless. Perhaps mosquitoes other than *Anopheles* become ensnared, although the writer does not recall seeing mosquitoes in spider-webs, even where both mosquitoes and spiders were abundant. Nor do there seem to be concise records of mosquitoes so caught. The hunting spiders that frequent dwellings and outbuildings no doubt destroy many of the mosquitoes that hibernate, or æstivate, as the case may be, in these situations; but we have very few actual observations on this point. It has seemed to the writer worth while to show that generalizations unsupported by sufficient and accurate data, with which economic mosquito literature now abounds, are likely to prove valueless and indeed misleading.

The Treatment of Leprosy.—In the *British Guiana Medical Annual* for 1911 Minett writes on the treatment of leprosy by nastin and benzoyl chloride. The work recorded in his paper is a continuation of an investigation commenced in December, 1908, by Professor Deycke at the Leper Asylum, Mahaica, British Guiana.

The conclusions Minett has derived from his study are as follows:—

(1) That nastin has apparently very little beneficial effect on cases of leprosy; (2) a solution of benzoyl chloride in oil shows a slightly higher percentage of improvement than nastin; (3) anæsthetic cases of leprosy run a definite course, after which the disease seems to die out, leaving the patient no longer infective; (4) these cases recover sensation after a time in areas previously anæsthetic; and after self-amputation only scars remain. This is a natural process and takes place without any treatment whatever. It is not apparently influenced by either nastin or benzoyl chloride; (5) nodular cases do not tend to improve naturally as above, except in very rare instances; nor do they appear to be affected appreciably by either nastin or benzoyl chloride; (6) the so-called destruction of bacilli is a natural process varying considerably and does not appear to be influenced by nastin or benzoyl chloride; (7) the variation of the amount of destruction of bacilli observed is of limited value as an indication of the effects of treatment; (8) benzoyl chloride in petroleum oil is extremely valuable as a nasal spray or a paint for ulcerating surfaces, it quickly renders the discharge free from the presence of bacilli; (9) its regular use for this purpose is strongly recommended in leper asylums.

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Tropical Medicine and Hygiene

MAY 1, 1913.

TROPICAL DWELLINGS.

AMONGST the many buildings to be seen at the Building Exhibition in London the architect or resident in tropical regions can find little to help him. The changes not only in the planning of houses, but even in the material of which they are constructed, show that man has not yet reached finality in what is the oldest form of construction in which he has engaged. Dwelling houses in temperate climates are made of stone, brick, concrete, ferro-concrete, lath and plaster, &c., &c., and roofed with slate, tiles, straw thatching, peat and turf thatching, or some one of the many devices and material now in vogue, such as asbestos compound, &c. Naturally the materials for building a house depend largely upon the geological formation of the ground in any particular area; thus granite, freestone, whinstone, limestone or brick are chosen according to the character of the rock formation in the neighbourhood or the components of the soil. In the Tropics also, as in more northerly climes, the building material varies with the geological formation and the available supply of wood; now it may be granite as in northern climes, wood in many American countries, or mud

as in Egypt, India, and many equatorial regions. That any one of these materials possesses superlative benefits over all others is doubtful, although it may be claimed that stone is theoretically and perhaps practically the one which most commends itself. What is wanted in a tropical dwelling particularly? In equatorial regions, say 12 degrees north and south of the equator, there is no cold weather to be guarded against; nor need there be any provision made against typhoons, cyclones, &c., for in the purely equatorial area calm prevails well-nigh perpetually. In this belt heat, rain, and a saturated atmosphere are the rule in Asia, but in some arid South American countries heat alone is the factor to be regarded. A thick-walled stone house in the equatorial area is by far the best for all purposes; it is cooler than either brick or wood, and does not absorb or hold the moisture during the rains. The inner wall may be wet from condensation, but that is not the damp that is so much dreaded in houses of less satisfactory material, and the very condensation helps to still further cool the air of the rooms when it evaporates. Next to stone, and leaving concrete out of the question, perhaps a mud wall carefully prepared of available materials is the best; being cheap, it may be made thick—two or three feet even—giving thereby coolness by reducing the penetration by the sun's rays to a minimum; mud, of course, has many disadvantages, for unless carefully looked after it is readily accessible to rats, and it is apt to crack and flake away. Bricks, more especially the inferior or blue bricks so commonly used, are not the best material for tropical dwellings, even if bricks are readily available. The quantity of water a brick can absorb is a feature calculated to engender deleterious consequences in a hot, moist climate and during the wet seasons. That the Israelites had trouble in their houses from this source was plain, for they not only described (Leviticus xxxiii) the greenish or reddish "strakes" on the walls due to a fungoid growth on a damp surface, but they considered that these were unwholesome signs and capable of producing skin diseases and even the plague of leprosy. The dampness of the walls means also dampness of bed and bedding, and accounts for the muscular rheumatism which is so frequent an ailment amongst Europeans in tropical countries. Rheumatism of the kind is more prevalent amongst Europeans in the Tropics than amongst persons native to the soil from the fact that cotton sheets are in general use, whereas the natives prefer blankets when they can get them, and dispense with sheeting.

Wood in the construction of houses in tropical countries has many drawbacks. Suitable as wood, in planks or in logs, may be in more northerly climates, it is not a material calculated to be hygienic in tropical climates. Built on unprepared ground as they usually are, it is impossible to protect the wood from the penetration of the excessive damp, from white ants, from ground insects of many kinds, and from the "dry rot" which attacks woodwork in all houses. To such an extent do these detrimental conditions prevail, that in Ceylon, for instance, intestinal lesions, and amongst them sprue, are ascribed by many old residents to the presence of decayed wood in their dwellings. Rubber and tea owners do not seem to realize the complaints of many of the overseers on their estates as to the evils ascribed to dry rot, &c., in the residences they provide for their occupation. That Dr. Bahr's suggestions that sprue is "catching," and that it may be communicated from one person to another dwelling under the same roof, is a step in the same direction, and it may be a common infection, rather than an inter-personal communication, due to "house" infection, that explains both husband and wife contracting sprue and several indefinite intestinal ailments allied thereto.

In addition to the actual materials of which the house is made, the drainage of the dwellings must be considered as well as the disposal of sewage. Houses built on ground not previously prepared—and most houses, at any rate, away from large towns in the Tropics are so—are calculated to be unhealthy, whatever their construction may be.

Throughout India, for example, the bungalow system holds good for the most part: a one-storeyed house, as a rule, built of unsubstantial material, devised originally as a temporary building, but seldom superseded by anything more permanent. The bungalow is built on the ground and, until recently, without any ventilation beneath the floor. This cannot be otherwise than an unwholesome dwelling, and as time goes on becomes dangerous. Yet it is in such houses that many Europeans live in these regions; women and children suffer especially, for they spend most of the day as well as the night indoors, whereas the man is out and about at his work. Constant complaints keep pouring in from outlying districts to the heads of firms that the houses provided for their employees are defective. The reply all too often is: "The house was good enough in my time, why should it not suit you?" The argument is untenable, the house was but newly built when the head of the firm, himself an employee at the time, dwelt there; damp and dry rot had not as yet affected it, but in time the house built of materials other than "pucka" deteriorates and the outcry of the more recent occupant is justified. The fact is that in many parts of Ceylon, Southern India, Assam, Java, and Sumatra, the exploitation of tea and rubber has led to rapid construction of dwellings, accompanied by the detriments which invariably belong to hasty building. Malaria is not the only enemy.

In our fight against actual disease, by scientific inquiries and experiments, we are apt to forget that sanitation in its broader aspect must be equally considered and dealt with. The hygiene of the house is the first principle in sanitation; our efforts to curtail disease without this principle being accepted and dealt with is but tinkering with the matter; and to continue occupying bungalows as they are usually met with in tropical countries is but encouraging disease and laying the foundation for future trouble. That people in bygone times

had a similar difficulty with their dwellings in tropical countries is proved from the fact that they from time to time moved their residences; that even a whole city would be deserted and a fresh one built near by; and not only have we proof that one such move was made, but with many cities in India, such as Delhi and elsewhere, several such removals were accomplished. Europeans would do well to follow the example thus set, and unless the dwelling they erect is made of durable materials, raised off the ground to a considerable extent, say three or four or more feet, drained satisfactorily, rendered impervious to damp by concrete or stone foundations, and the ground even on which it stands treated so that damp does not rise directly into the house, then it is well to condemn a house that has been standing for ten or twelve years and erect another. This is but false economy, however, and it would be well for all concerned to see that houses are built on sounder principles than as a rule at present obtains in many rural districts throughout the Tropics.

Annotations.

The Relationship of the Malarial Parasite to the Erythrocyte.—Miss Mary Rowley-Lawson, in the *Journal of Experimental Medicine*, vol. xvii, No. 3 (March 1, 1913), discusses this question under the title, "The extracellular relation of the malarial parasite to the red corpuscle, and its method of securing attachment to the external surface of the red corpuscle." She believes that the malarial parasite is extracellular during its entire developmental cycle; that is, with the exception of the brief periods when it is free in the blood serum, it is attached to the outside surface of the red corpuscle.

The parasite secures its attachment to the outside of the red corpuscle by means of filamentous pseudopodia thrown out by the parasite for that purpose. The attaching processes are described as (1) primary, and (2) secondary (accessory) attaching pseudopodia.

(1) *Primary Attaching Pseudopodia.*—These are delicate thread-like processes, arising from the cytoplasm of the parasite, near its nucleus. The parasite appears to secure its primary hold on the red corpuscle by means of these pseudopodia; but as the corpuscular mound to which the parasite is attached becomes dehæmoglobinized, or decolorized, or as the parasite increases in size, accessory, or secondary attaching pseudopodia are formed.

(2) *Secondary Attaching Pseudopodia.*—These may be thrown out from various portions of the cytoplasm of the parasite, apparently for the purpose of securing a firmer hold on the red corpuscle. The pseudopodia can be seen overlying the red corpuscle in the form of a loop, while the body of the parasite, with its nucleus, may lie either on the surface of the red corpuscle, or along its periphery in close apposition to the corpuscle. Occasionally, especially in the very young parasite, the loop may be formed from the entire protoplasm of the parasite.

The parasite squeezes up that portion of hæmoglobin substance which lies within the boundary of this loop into a mound, circular at the base, with a more or less rounded apex. The parasite when thus attached maintains its position on the outside of the red corpuscle by means of the pseudopodia encircling this mound at its base. With very few exceptions the adult parasite is attached to the surface rather than to the periphery of the red corpuscle. Miss Lawson believes that the explanation of this is that the surface of the red corpuscle affords a larger area for occupation as well as for absorption. In this situation, moreover, the chances for the forcible removal of the parasite from the red corpuscle are fewer.

When the parasite is attached to the under surface of the red corpuscle the blue staining protoplasm of the parasite viewed through the red corpuscle is paler and the outlines of the parasite are less distinct than when the parasite is seen on the upper surface of the red corpuscle. When two parasites are attached to the one corpuscle, one on either surface, these differences can be well seen, and also the same differences can be noted when a single parasite is seen on both surfaces of the red corpuscle.

When a parasite, especially an adult, is attached to the under surface of a red corpuscle, the nucleus may be indistinct or obscured from view by the overlying, blue-stained protoplasm of the parasite, and may give the impression of a parasite without a nucleus.

Occasionally an adult parasite is attached to a corpuscular mound in a position so close to the periphery of the red corpuscle that the nucleus of the parasite projects beyond the periphery. It is not at all uncommon to see the nucleus of the young parasite of the æstivo-autumnal infections projecting beyond the periphery of the red corpuscle to which the parasite is attached, and occasionally the nucleus of a tertian ring may be seen beyond the periphery of the red corpuscle.

The terms achromatic area, or milky zone, have been applied to the decolorized, transparent, and pigment-free corpuscular area encircled by the filamentous pseudopodium of the parasite.

The decolorization of the corpuscular mound is gradual, proceeding as the parasite digests the hæmoglobin. All stages between the deeply coloured mound of unaltered hæmoglobin and the completely decolorized one have been observed, and can be followed with the microscope in fresh blood as well as in stained specimens.

Complete decolorization, or dehæmoglobinization, of corpuscular mounds surrounded by parasites may be seen in red corpuscles showing Schuffner's granulation, and in red corpuscles with blue stippling, suggesting that these granulations form a part of the corpuscular substance digested by the parasite.

The decolorization of the corpuscular mound by the young ring-form parasite, especially of the æstivo-autumnal infections, may be complete before

the appearance of any demonstrable pigment in the protoplasm of the parasite.

It has been believed that the achromatic area was an essential part of the malarial parasite, and it has been variously described as a vesicular nucleus, a digestive vacuole, and a thinning of the protoplasm of the parasite which allowed the red corpuscle to show through. When certain of these decolorized areas were seen at the periphery of the red corpuscle they were pictured and described by Mannaberg and Marchiafava and Bignami, who interpreted them as extracellular parasites resting in niches at the periphery of the red corpuscle.

That the colourless, or dehæmoglobinized, corpuscular area surrounded by the parasite is more or less transparent seems proved by the following facts: (*a*) When the achromatic area of one corpuscle partially overlies the periphery of another red corpuscle, this periphery can be distinctly seen through the achromatic area. (*b*) When the achromatic area of one red corpuscle partially overlies that of another red corpuscle, the nucleus and the protoplasm of the parasite surrounding the underneath decolorized area is clearly seen. (*c*) When the smear is made on the cover-slip, precipitation of stain may be seen more or less clearly through the decolorized corpuscular mound. (*d*) When the parasite-infected corpuscles are piled up, one completely over another, it is impossible to find any completely decolorized corpuscular mounds, although many decolorized areas surrounded by parasites may be seen where the smear is thinly spread.

The fact that the area which is surrounded by the parasite is sometimes seen to be achromatic and transparent, when other portions of the infected corpuscle show good colour, proves that this area is not parasitic. For if this area belonged to a parasite which was attached to a deeply coloured red corpuscle, the area would have to be opaque in order to be achromatic, otherwise the colour of the corpuscle would show through it more or less clearly.

Infection of a corpuscular mound by more than one parasite may be seen in all the malarial infections. The best examples are observed in the æstivo-autumnal infections. As might be expected, instances of multiple infection are most frequently met with in cases where the parasites are numerous.

The majority of young parasites occupying the one corpuscular mound are in similar stages of development. This similarity in size is easily explained, as the parasites are probably of one brood, and it may be the result of one segmenting parasite. Parasites of varying sizes occupying the one corpuscular mound may be explained by supposing that a young parasite attaches itself to a corpuscular mound already occupied by a parasite of an older brood.

The parasites seem to follow no rule as to their position in relation to each other in the occupancy of the one corpuscular mound. The bodies or nuclei do not coalesce, as with careful examination with an apochromatic lens of high power the parasites can be differentiated, one from the other, even in some of the cases where the parasites are actually superimposed.

In cases of multiple infection of a corpuscular mound, the parasites seem to proceed with the destruction of the mound in the same way that the single parasites do. Occasionally one of the young parasites may show a grain of pigment in its protoplasm.

Multiple infection of a corpuscular mound should not be confused with the appearance produced by a single parasite whose protoplasm is intact, but whose nucleus is broken up by the technique used in spreading the smears. Such parasites with nuclei forcibly separated into parts, which may be of varying sizes, are usually found along the edges of smears made on slides, and the interpretation is made easy by the fact that parasites with nuclei similarly distorted may be found in groups. A young parasite never has more than one nucleus.

The close approximation of two parasites occupying the same corpuscular mound has undoubtedly led to many conceptions or theories as to the conjugation of malarial parasites; but the fact that the corpuscular mounds occupied by more than one parasite may be seen at the periphery of the infected red corpuscle makes this appear doubtful.

Miss Lawson has not been able to find any evidence of conjugation of malarial parasites in any stage of development, and she believes that Craig's "conjugating parasites" are the result of a wrong interpretation of the infection of a corpuscular mound by two young parasites. The idea that the parasites were intracellular perhaps led to the misconception.

The majority of free parasites seen in malarial infections have a compact structure. Free parasites are rarely seen with pseudopodia extended for attachment, but occasionally free parasites are seen with their pseudopodia in the form of loops, with or without the nuclei at the extremity of the loops. These free parasites with the loop-form pseudopodia are in migration, and have been set free while their pseudopodia are still in the form assumed by the parasites for attachment to corpuscular mounds.

[This interesting paper is splendidly illustrated and should be read in the original in conjunction with the plates delineating the infected corpuscles.]

Special Methods for the Detection of Parasitic Ova in the Fæces.—Darling, in a paper published in the *Proceedings* of the Canal Zone Medical Association for the half-year, April to September, 1911 (vol. iv, part 1), gives details of an investigation on the intestinal worms of three hundred insane patients detected by special methods. He thinks that nearly all the routine examinations of fæces for ova, larvæ or worms, and nearly all the published accounts of the prevalence of intestinal worms in man and animals, are defective on account of the imperfect means used for detecting ova or parasites. The method of examining undiluted or diluted fæces in cover-slip preparations is uncertain, and when many preparations are to be examined, it is too

laborious to yield results of high relative accuracy. When results giving the absolute incidence of infection are desired, special methods must be used.

During a recent investigation of *Strongyloides* infections, he had a favourable opportunity for noting the incidence of intestinal worms in 300 insane patients at Ancon Hospital, Canal Zone. The results reported in his paper were obtained by a combination of three methods:—

(1) Plate-culture method.
(2) Differential-density method.
(3) Direct smear method.

Each of these methods is designed to give special information more exactly, and when many stools are to be examined more quickly with less labour and eye fatigue than the direct smear method does when used alone.

The specimens of the stools were collected in heavy glass test tubes, five by five-eighths of an inch. First a portion of the stool was placed in the centre of a Petri dish, several drops of sterile tap water added, the dish covered and incubated at room temperature, 76° to 84° F., for eighteen to twenty-four hours. Upon examination with the dissecting microscope the presence of *S. stercoralis*, either filariform embryos, or the sexually differentiated adult free-living generation would be detected if present. Sometimes adult *Oxyuris vermicularis* and hookworm larvæ could be seen in the Petri dish culture as well.

Next, a portion of the fæces, diluted with sterile tap water, if necessary, was placed on a slide and covered with a cover-slip. This was examined for protozoa, ova of different helminths and larvæ of *Strongyloides*. The method was used chiefly for the detection of amœbæ and flagellates and in a number of instances for comparison with the other methods.

Finally, the tubes containing the fæces were nearly filled with sterile tap water thoroughly mixed with a glass rod and centrifuged at 1,800 to 2,000 revolutions for a few seconds, the supernatant fluid removed and the tubes refilled with a solution of calcium chloride of a specific gravity of 1.250, thoroughly mixed and centrifuged as before. The surface film was now pipetted off and examined microscopically on a slide for ova. The upper layers in the tubes and the supernatant fluid near the surface were also examined grossly for adult or immature worms (threadworms and hookworms). This method segregates all the ova, worms and some of the *Strongyloides* larvæ, chiefly the dead ones. By a combination of the methods mentioned Darling believes it is possible to increase the number of positive findings very considerably.

From 100 stools in which the fresh film method was compared with the plate culture and differential density method (Bass'), the following results were obtained:—

Strongyloides stercoralis (1): larvæ of adult free-living generation	Number of times detected in fresh film preparations (two cover-slip preparations were used)	3
do.	Plate culture method (by)	22
Hookworm ova	Number of times detected in fresh film preparations	17
do.	By differential density method	49
Whipworm ova	Number of times detected in fresh film preparations	12
do.	By differential density method	46
Roundworm ova	Number of times detected in fresh film preparations	1
do.	By differential density method	2

In contrast with other tropical regions, such as the Philippines, Egypt, Hong-Kong, &c., the Canal Zone does not support a very varied human intestinal fauna, the reason being that the sanitary disposal of dejecta, modern and efficient methods of disposal of sewage, the wearing of shoes by labourers and the enforcement of salutary sanitary regulations have reduced materially the number and grade of infections encountered.

The following intestinal parasites were detected however:—

Nematodes: *Ankylostoma duodenale*, *Oxyuris vermicularis*, *Necator americanus*, *Strongyloides stercoralis*, *Ascaris lumbricoides*, *Trichuris trichiura*.

Cestodes: *Tænia saginata*, *T. solium*, *Hymenolepis nana*, *Tænia echinococcus*.

Trematodes: *Schistosomum hæmatobium*.

Protozoa: *Balantidium coli*, *Entamœba histolytica*, *E. coli*, *Trichomonas vaginalis*, and other flagellates.

Among the natives of this region and the West Indies no instance of infection by a cestode has been authenticated at autopsy. Cestode infections are confined to the Europeans and Americans. From a comparative point of view this is strange, because the native dogs, cats, rats, birds, &c., harbour many varieties of this class of worms. Few opportunities for examinations of native Panamans, living in the Provinces, have occurred, however, but in no instances have cestode ova been detected.

The methods of examination used give a much higher proportion of infected individuals than those usually used in routine examinations and in the reported accounts of other investigations, excepting those of Calvert in India, and Ashford, King and Gutierrez.

From autopsy material Darling has determined the presence of *Ankylostoma duodenale* and *Necator americanus*, *Trichuris trichiura* and *Ascaris lumbricoides* as the nematodes corresponding to the ova detected.

From cultures he has further identified *Strongyloides stercoralis* and *Oxyuris vermicularis* has been identified from the stools.

The persistence of hookworm infections, most of which were mild, illustrates how difficult it is to thoroughly rid the intestinal tract of this worm by the customary methods.

The relative infrequency of typhoid fever among the blacks in the Canal Zone compared with many towns and cities in the United States, as well as the great rarity of appendicitis among the blacks

here and the relative frequency of whipworm infections in the same class of individuals, indicate that in this region among the blacks, the whipworm does not play any part in the causation of the diseases mentioned. On the other hand, Darling believes that there is little doubt that amœbic colitis may begin by the infection of and entrance of amœbæ through the points of attachments of the whipworm in the large bowel, particularly the cæcum. Amœbic infections of the intestinal tract are always confined to the large bowel and appendix, and frequently the only lesions noted at autopsy are a few ulcers in the cæcum in the exact location of the point of attachment of the whipworm to the mucosa. These points of attachment are sometimes the seat of inflammation, and the association of amœbic colitis and of whipworms in the same bowel has been noted a number of times.

The small number of infections by *Ascaris lumbricoides* is probably due to the following reasons: *Ascaris* infections usually yield readily to treatment and they are more commonly met with during adolescence. The patients in the insane division are mostly in the third and fourth decades of life and they have all been under anthelmintic treatment.

Strongyloides stercoralis in cultures was found to develop in both modes: the direct filariform and also the indirect mode. The latter is much more commonly encountered among natives of the Tropics than the former.

The proportion of infections by this nematode is higher among the insane than among other individuals to judge from the literature on this subject, but it must be said that the cultural method has not been carried out in other examinations reported in the literature.

The infection is probably a very persistent one, for it has been found in several insane patients between 60 and 70 years of age.

With regard to the question of the relation of *Strongyloides* in diarrhœa, Darling was informed by Drs. Lawler and Drennan, who have charge of the patients, that in not one of the fifty-seven cases of *Strongyloides* infections detected was there a case of diarrhœa, thus confirming the view of Grassi and others that this nematode does not cause diarrhœa.

The infections by *Oxyuris vermicularis* are peculiarly interesting on account of their relative infrequency among natives, and also that by the differential density method it is necessary to look for adult worms in the supernatant fluid of the centrifuge tube, as well as for ova, for the latter may be absent and the former present.

The Treatment of Pellagra.—Martin, in the *New York Medical Journal* for March 15, 1913, writes on "The Specific Treatment of Pellagra." The relative values of sodium arsanilate and salvarsan are compared. Eighty-three cases were studied. Of these, four came first under observation in 1909, nine in 1910, thirty-five in 1911, and thirty-five in 1912.

A very careful analysis of their records caused the author to exclude forty-five on account of the data being insufficient for certainty. These forty-five cases were treated for a short time with sodium arsanilate in some instances, and some others had single doses of salvarsan, and almost all of them ended in recovery, but the cause and effect are not absolutely certain, and they are, therefore, not offered as evidence. Some of the forty-five are also still under treatment. Of the thirty-eight others, eleven come from the sodium arsanilate series and twenty-seven from those treated with salvarsan.

The eleven cases sufficiently treated with sodium arsanilate gave nine recoveries and two deaths. Of the nine patients who recovered there were two who had received single doses of salvarsan, but the arsanilate treatment preponderated. Each patient received many doses of the arsanilate, and treatment was kept up in most instances over two summers. One of the recovered cases dates from 1909, four from 1910, and four from 1911.

Of the two fatal cases, one terminated fatally from chronic nephritis, the other from cerebral complications probably made worse by the slight reaction sometimes following sodium arsanilate in very severe cases.

Of the twenty-seven cases taken from the salvarsan series twenty show apparent cure, three are doubtful, but greatly improved, and four ended fatally after treatment was begun.

Of the twenty presumed cures, seven were treated in 1911 and remain cured. Four of these came back and received midwinter doses of salvarsan which may or may not have been necessary. There were thirteen patients seemingly cured by salvarsan in 1912, of whom nine were discharged previous to August 1 and are still well. These twenty cases and the three doubtful ones received the following number of doses: Four received five doses each, twelve received six doses each, two received seven doses each, three received eight doses each, one received ten doses, and one received twelve doses.

These doses were usually given at intervals of from seven to ten days, and the first dose was usually 0.2 grm., the second dose 0.4 grm., and the subsequent doses whatever the patient's weight called for, basing the full dose on 0.1 grm. for every twenty pounds after allowing for clothing.

Comparing final results from sodium arsanilate and salvarsan, there seems to be but small choice between them. Each seems entirely to cure the cases completely treated. The arsanilate must be given hypodermically from three to five days apart for from eighteen months to two years, allowing a three weeks' interval between each course of 100 gr. This is laborious, but it is at least possible, while intravenous medication is not. For this reason alone the arsanilate treatment will probably be the most used in rural districts where distilled water cannot be procured fresh from the still, and where the intravenous needle is not required often enough for the practitioner to acquire sufficient

skill to administer repeated doses in the same spot without injuring the vein, often the only available vein and needed for future doses. On the other hand, the early results from the arsanilate are extremely slow compared with the almost miraculous disappearance of symptoms in the majority of cases after using salvarsan, and many cases are so slow to begin to improve on sodium arsanilate that the patients and the physician both become discouraged.

The average patient will take six doses of salvarsan in five weeks and be cured thereby, and that is evidently preferable and should be the course pursued whenever the patient can be so treated or can reach such treatment. Some patients can afford to remain away from home only about two weeks, long enough to get three doses. When that is the case it is well to give them that much intravenous treatment and then have the arsanilate kept up after they get home. With two such specifics which will practically cure all cases not rapidly approaching the grave, the author thinks it is time for physicians in America to cease thinking of pellagra as an incurable disease.

Typhoid Vaccination.—Young gives a very excellent summary of recent literature on this subject in the *Boston Medical and Surgical Journal* for March 13, 1913.

He states that typhoid vaccine may be used in three ways: (1) As a prophylactic; (2) as a therapeutic agent in active typhoid; (3) as a therapeutic agent in chronic typhoid carriers.

The method of immunization used in the American Army is as follows: the site of puncture is sponged with alcohol and a small area is sterilized with tincture of iodine. The injection is then made with a sterile syringe, the puncture wound being sealed with collodion. The first dose contains 500 million bacilli, the second and third one billion each. An interval of ten days is allowed between doses, the entire procedure thus taking twenty days. The injection is given subcutaneously, and no vaccine over four months old is used. The duration of the immunity conferred is stated by Firth to be two and a half years. Leishman believes reinoculation should be done after two years.

The treatment of typhoid fever by vaccines is still in the experimental stage. Different authors recommend doses from one million to one billion, with varying intervals between doses. The sum of opinion is favourable. It is claimed that the fever period is shortened, and that complications, relapses and mortality are markedly reduced; while the use of the vaccine is attended with no bad results and in no way increases the patient's discomfort. Callison has recently collected 475 cases of typhoid fever treated with vaccines from the literature. Omitting 52 cases in which the dose was one or two millions, unquestionably a dose too small to have any effect, the mortality in the remaining 423 cases was 5.4 per cent., with relapses in 6.5 per cent. Callison recommends that vaccine treatment should be instituted as early as it is possible to make a diagnosis. His initial dose is 500 million bacilli; the inoculation is repeated at four-day intervals as long as required, increasing the dose 100 million each time. In his last series of fourteen cases no patient received more than six, with an average of three to four inoculations. Although 475 cases is too small a number from which to draw conclusions, especially in so protean a disease as typhoid fever, the results obtained are encouraging.

Medical literature contains numerous reports of chronic typhoid carriers, but there has not been much discussion of the treatment of these patients. Brem and Watson, reviewing the literature in November, 1911, found, including one case of their own, only twelve recoveries of typhoid carriers. Three chronic intestinal carriers recovered after operations on the gall-bladder, one during the administration of *Bacillus bulgaricus* in large doses, one after repeated exposure of the gall-bladder to X-rays, and one urinary carrier after the administration of hexamethylenamin in combination with boric acid. One intestinal, three urinary and two carriers discharging bacilli from bone lesions were cured with autogenous vaccines. Cummins, Fawcus and Kennedy treated seven typhoid carriers by various methods and were sure of the recovery of only one patient, an intestinal carrier treated with lactic acid bacilli. Vaccine treatment failed in the three cases in which it was tried, one intestinal and two urinary carriers. Since the publication of Brem and Watson's paper, six cases, one urinary and five intestinal carriers, treated with vaccines have been reported. Two intestinal carriers, one with an acute cholecystitis that recovered without operation, and a bacilluria of twelve years' duration were cured. Two intestinal carriers have remained free from typhoid bacilli for three and one-half and six months. The sixth case, a chronic suppurative cholecystitis, was drained and the discharge gave a pure culture of *B. typhosus*. The sinus gave no evidence of healing until a vaccine was given. In the treatment of typhoid carriers Meader recommends an initial dose of 100 million bacilli repeated at intervals of two weeks, increasing the dose 200 million each time.

The author's summary is as follows: (1) Typhoid vaccine as a prophylactic provides almost certain protection from typhoid fever. (2) Typhoid vaccine as a therapeutic agent in active typhoid is still in the experimental stage. A sufficient number of cases have not been studied to enable one to draw definite conclusions. The results so far obtained, however, are favourable. (3) Typhoid vaccine as a therapeutic agent in chronic typhoid carriers, while it does not offer certain cure, is the method of treatment that has given the best results.

"Bulletin de la Société Medico-Chirurgicale de L'Indochine," Tome iv, Février, 1913, No. 2.

Liver Abscess.—Degorce reports an interesting case of a liver abscess in which gas and a biliary calculus were found. The patient was operated upon, and made a good recovery. The abscess was situated in the liver substance, and had no communication with the intestine. An examination of the calculus found in the abscess showed that it consisted of a hard and soft part, the former consisting of phosphate of lime, the latter of fatty *débris*, fibrin, and dried blood.

Abstract.

Experimental Amœbic Dysentery and Liver Abscess in Cats.

Wenyon, in his interesting paper on this subject in the *Journal of the London School of Tropical Medicine*, December, 1912, giving details of his experiments, writes that Hlava and Kartulis first showed that amœbic dysentery could be produced in cats by infecting them per rectum with mucus or fæces from cases of amœbic dysentery in man. Quincki, Roos, Kruse, Pasquale, Strong and Musgrave repeated these experiments, while Kartulis further showed that dogs could be infected similarly. Musgrave and Clegg produced dysentery in monkeys in the same manner. Kruse and Pasquale succeeded in producing dysentery in cats by the injection of pus from an amœbic liver abscess which was shown to be bacteria free. Hartmann has pointed out that the entire absence of bacteria in a liver abscess is very difficult to demonstrate. One cannot state more than that the cultural methods adopted failed to reveal their presence. It is possible that some other method of culture would have succeeded. Jurgens stated that the amœbæ actually forced their way through the healthy epithelium of the cat's gut; and Schaudinn attributed their power of doing this to their tough ectoplasmic pseudopodia. It was Schaudinn who first clearly distinguished a non-pathogenic and pathogenic amœbæ of man under the names of *Entamœba coli* and *E. histolytica* respectively. By feeding cats on material containing cysts of *E. histolytica* amœbic dysentery was produced.

Is *E. tetragena* the same as *E. histolytica*? In cases of dysentery, Viereck discovered an amœba that differed in life-history from Schaudinn's *E. histolytica*, and named it *E. tetragena* because the mature cyst contained four nuclei. These *tetragena* cysts were then recognized by Hartmann and have now been found in almost every part of the world where amœbic dysentery occurs; and Viereck's amœbæ is now looked upon as the common pathogenic amœba of man. It is thus difficult to account for Schaudinn's *E. histolytica*.

Hartmann has re-examined many of Schaudinn's preparations and finds that his *E. histolytica*, in most cases at least, corresponds with *E. tetragena* of Viereck. It seems highly probable that Schaudinn failed to recognize the cysts with four nuclei and that the small spores described by him were structures unconnected with the amœba. Adopting this view, it comes about that *E. tetragena*, Viereck, is none other than *E. histolytica*, Schaudinn; and that Viereck regarded it as a distinct species because he had discovered the true life-history, which of course differed from the erroneous one given by Schaudinn. Provided the latter was right in naming the pathogenic amœba *E. histolytica*,* the name *tetragena* is no longer required; the common pathogenic amœba of man is still *histolytica*, but the life-history is that discovered by Viereck—not that described by Schaudinn.

Attempts to confirm Schaudinn's Observations on E. histolytica.—Wenyon, in 1907, in Khartoum, studied cases of amœbic dysentery, but failed to discover any indication of the development described by Schaudinn for *E. histolytica* (Third Report, Wellcome Research Laboratories). Since then he had tried repeatedly to obtain some confirmation of this development and especially of the production of the small infective tough-capsuled spores, but always without success. Viereck's discovery cleared the ground and we now know that the human pathogenic amœba produces not the tough spores of Schaudinn, but the transparent cysts described by Viereck. On account of the doubtful technique he employed, Craig's confirmation of Schaudinn's results are hardly convincing.

Out of a large number of observations on cases of amœbic dysentery in man, Wenyon has found the typical cysts of the pathogenic amœba on six occasions only. It is unfortunate, for diagnostic purposes, he writes, that the cystic forms occur in only a small percentage of cases of amœbic dysentery, for they are comparatively easy to recognize; they can be readily distinguished from the cysts of *E. coli*, and it is their presence which assures one more than anything else that the amœba in question is the pathogenic form. It is admitted that the pathogenic and non-pathogenic amœba of man are subject to much variation, so that differences at one time marked are hardly to be recognized at other times. The cause of encystment is unknown. As a rule, during the height of a dysenteric attack encysted forms are not seen; they appear to be formed when the patient is recovering naturally from the disease. The encysted forms of the pathogenic amœbæ are seen, therefore, most often during periods when the dysentery is in abeyance. When cysts occur they usually do so in large numbers; at such times one finds more encysted amœbæ than free forms. From such cases Wenyon has been able, by suitable methods of preparation, to confirm in every essential respect the observations of Viereck and Hartmann on the encystment process of the pathogenic amœba, but not any of the life-history as Schaudinn described it.

The Production of Amœbic Dysentery in Cats.—The material used in the experiments was obtained from a European from Bombay, whose stools contained numbers of free and encysted amœbæ. The patient was admitted to the Seamen's Hospital, Royal Albert Dock, not for dysentery, but for severe anæmia. On close inspection the stools were found to contain some small flakes of blood-stained mucus and the microscope revealed amœbæ, the encysted forms having the typical character of *E. tetragena*, Viereck. About 5 c.c. of this material was injected per œsophagus and per rectum into two cats. Both animals developed amœbic dysentery. Such experiments have been conducted with this amœba by Viereck, Werner, Hartmann,

* E. Brumpt ("Précis de Parasitologie," Masson et Cie., Paris, 1910) gives *Amœba dysenteriæ*; Councilman et Lafleur, 1893, synonymie: *Entamœba histolytica*, Schaudinn, 1903.—H. M. H.

and recently by Darling in Panama. These observers have shown that ingestion of the amœbæ alone by the cats does not produce dysentery, whereas ingestion of the encysted forms will do so. Injection of the amœbæ themselves per rectum will produce dysentery. In Wenyon's experiment, both cats were passing typical dysenteric stools containing much blood and mucus and many amœbæ, nineteen days after the injection. It is probable they had been already infected for some days, so that the incubation was less than nineteen days.

From these cats others were infected, and Wenyon was able to carry on the infection through four passages; and but for an accident could have carried it much further, as there was no sign of decreasing virulence in the strain of amœbæ employed. Hartmann states that from his own experiments with this amœba, and those of Viereck and Werner, the infection of cats is not satisfactory, and that after two, or at most three, passages the infection ceases. Wenyon, from his experiments, holds that with care it would be possible to carry on the infection indefinitely in cats. In the subinoculations the ulcerated large intestine of the cat (which had died naturally from the disease, or had been killed when about to die) was opened and washed in physiological saline solution, the washings being then injected into the large intestine of the next cat. Only once did this fail to produce amœbic dysentery, and in that instance the cat was the largest one used; therefore, to ensure success one must employ young kittens soon after they have become independent of the mother.

The Production of Amœbic Abscess of the Liver in Cats.—It was often seen that the mesenteric glands draining the ulcerated areas of the gut (nearly always the lower part of the large intestine was ulcerated) are swollen, and on section these contained a large number of amœbæ which appeared to be feeding on the gland tissue, for their bodies were often packed with gland cells, resulting at times in the complete destruction of the glandular tissue. One of the cats which contracted dysentery as a result of the injection of amœbæ from a cat of the third passage, not only developed typical dysenteric ulceration of the gut, but also abscess of the liver in which were numerous amœbæ. There were four superficial abscesses, the largest with a diameter of ½ cm. Had not the cat died of dysentery before the abscesses increased in size, it would have been possible to conduct experiments with the amœbæ from them. The liver of this cat had not been injured in any way; the abscesses had developed spontaneously as a result of the amœbic infection. The whole picture of amœbic dysentery, with its complication—amœbic liver abscess—in man was thus produced experimentally in the cat. The fact that it was in the fourth passage that the abscesses developed indicates that the amœbæ had lost none of their virulence in these passages; and pointed in a striking manner to the true pathogenicity of Viereck's *E. tetragena*.

The Invasion of the Tissues by the Amœbæ.—It is difficult to decide exactly how the amœbæ reach the liver from the intestines. It would probably be by way of the portal blood-vessels; this is perhaps borne out by the fact that one cat developed pyæmia in which the whole blood system contained pus. The amœbæ commonly invade the mesenteric glands, so that a lymphatic course is possible. The invasion process is easily studied in sections of the ulcerated large intestine. The amœbæ make their way to the bottom of the tubular gland. There they multiply and by pressure of their numbers or by the exertions of their pseudopodia, and probably through some toxic substance excreted by them, the living cells are weakened and separated and the amœbæ pass into the connective tissue beneath. The epithelial cells begin to degenerate and the earliest stage of ulceration is reached. Bacteria are thus admitted, the destruction becomes more rapid, and the amœbæ push on to the deeper layers and give rise to the characteristic undermined ulcers of amœbic dysentery. Wenyon has shown, in the case of the natural infection of mice with *E. muris*, that these amœbæ often enter the tubular glands of the large intestine of the mouse, and may reach their deepest extensions. In the case of this harmless amœba, the invasion of the glands is not followed by any disintegration of the glandular epithelium, whereas the similar invasion of the glands of the cat by the human pathogenic amœba is immediately followed by ulceration. Wenyon believes that with the pathogenic form there must be some toxic substance which so weakens the epithelium of the glands that the amœbæ are able to force their way through, perhaps before it has actually disintegrated. It is difficult to believe that the pathogenic amœbæ can force its way through uninjured and healthy epithelium. If so, then *E. muris* should penetrate the glandular epithelium of the mouse's gut. To state that, for this purpose, the pathogenic amœba has a tougher pseudopodium is a pure assumption; for *E. muris* may have pseudopodia quite as substantial, as far as one can judge, as those of the pathogenic forms.

Other Amœbæ from the Human Intestine.—One cat was given per œsophagus and per rectum a large quantity of fæces containing numerous free and encysted *E. coli;* another cat received per rectum an injection of fæces from another case in which only free forms of *E. coli* occurred. Neither became infected, nor did they suffer in any way from the injections. They were later infected with material from dysenteric cats and both developed amœbic dysentery. An attempt was made to infect another cat with a small amœba which occurred in enormous numbers in the fæces of a native of India. The amœba varied in size from 3 to 10 microns, and had a nucleus of the typical *limax* type. It was constantly present in the stool for the three weeks the case was kept under observation. Numerous as were the amœbæ, they seemed to have no ill-effect on their host, who was admitted to hospital for quite other reasons. The cat, though it received per rectum many millions of this amœba, did not become infected.

The Amœbæ as they occur in Cats.—The normal healthy amœbæ correspond exactly with those from the human intestine; and just as in cases of amœbic dysentery in man, many of the amœbæ are degenerate and show abnormalities in nuclear structure, so in the cat one encounters many altered forms; as Hartmann has shown, in the cat the number of altered abnormal amœbæ is greater than in man.

The occurrence of these abnormal forms, especially those in which the nucleus has undergone a change and broken up into scattered chromidia, may easily lead to errors of observation. Hartmann admits that he himself was misled by such altered forms and that he saw in them a confirmation of Schaudinn's development of *E. histolytica*.

On no occasion did Wenyon find the cysts of Viereck in the fæces of the cats, probably because in the cats the dysenteric process did not pass beyond the acute stage. If the cats had begun to recover naturally, it is possible the encysted forms of the amœbæ would occur in the fæces.

This experimental work is justly claimed to have established that the amœba (*E. histolytica*, Schaudinn; *E. tetragena*, Viereck) is the true and exciting cause of amœbic dysentery and liver abscess in man; and further that there occurs in man, besides the pathogenic amœba, a non-pathogenic form, *E. coli*.

Notes and News.

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.—At a meeting of the Society of Tropical Medicine and Hygiene held at 11, Chandos Street, Cavendish Square, London, W., on Friday, April 18, 1913, at 8.30 p.m., the following gentlemen were elected Fellows: Alakh B. Arora, L.R.C.P. and S.Edin., India; Fleet-Surgeon F. H. A. Clayton, M.D., R.N., Haslar; R. A. O'Brien, M.D.Melb., Battersea Park, S.W.; Francis W. O'Connor, M.R.C.S., London School of Tropical Medicine; David Thomson, M.B., Liverpool; J. G. Thomson, M.B., Liverpool; G. C. Vickery, M.B., Devonport.

Drugs and Appliances.

Byno Lecithin.—Allen and Hanburys, Ltd., are bringing out a new addition to their well-known series of Bynin preparations. This is called Byno Lecithin (malted lecithin), and is a valuable tonic, nerve food, and digestive.

Lecithin is a phosphorized body of the formula $C_{44}H_{90}PO_9$. It enters largely into the composition of the nervous system. It is stored in the liver; and while ordinary fats vary directly with the supply, lecithin is a constant constituent of the liver cells, even in prolonged starvation. This has suggested that lecithin is the first step in the synthesis of inorganic phosphorus to form the complex nucleins of the cells, and that the fats of the liver may act by combining with this phosphorus to fix the latter and prevent its excretion.

Lecithin was first isolated and described in 1850 by Gobley, who obtained it primarily from the eggs of the carp. He concluded that a similar substance occurred in large amounts in the brain, and this view was subsequently confirmed by Hoppe-Seyler and Diaconow. When decomposed, lecithin yields glycero-phosphoric acid, stearic acid, and neurine. The ash contains metaphosphoric acid. Recent research suggests that the term "lecithin" must apply to several allied organic substances containing phosphorus radicles united to varying fatty bases. It is usual, therefore, to speak of such as the "lecithin compounds."

This brief survey of the chemistry and physiological distribution of lecithin is sufficient to indicate its importance in the animal economy. Foods containing lecithin are now recognized to be of the utmost value in the dietary of those suffering from nervous debility, whether of primary origin, or secondary to acute or chronic disorder. Products containing lecithin derived from egg or milk proteid have been in considerable demand, and have been administered with success.

In Byno Lecithin, lecithin is combined with Bynin, a pure malt extract, containing the complete activity of the diastasic ferment.

The combination also contains in solution a definite standardized amount of the compounds of cinchona in combination with their natural acids, and in addition in each ounce an amount of nux vomica equal to 1/40th of a grain of strychnine, which powerfully reinforces the tonic action of the cinchona.

These alkaloids exert a direct stimulating action on the nervous system and organs of the body. The dose of the new preparation is half an ounce, three times a day, half an hour before meals.

Review.

THE MINERAL WATERS OF VICHY. For the use of Practitioners. By Charles Cotar, M.D.Paris, Consulting Physician at Vichy. London: H. K. Lewis, 136, Gower Street, W.C. 1913.

The literature dealing with the general study of mineral waters, and the thermal stations in particular, is very scattered, so the above work should be welcome.

The author, Dr. Cotar, a consulting physician at Vichy, gives in it a complete account of the subject of hydrotherapy.

After giving the theories concerning the origin of the waters and their chemical, hygienic, and gaseous properties, he reviews their physiological action, so that it becomes easy to deduce their medical indications and contra-indications; the latter

are corroborated by the observations and numerous contributions of his colleagues on the spot, and the author's own personal experiences are also, of course, added. These are of very great value.

A chapter is devoted to diseases of children, and in the concluding chapter a comparison is made between Carlsbad and Vichy.

A complete index makes it easy to find any information which may be needed.

Personal Notes.

COLONIAL MEDICAL SERVICES.

West African Medical Staff.

April, 1913.

No deaths.

No transfers.

Retirements.—A. W. Atkinson, M.B., Ch.B.Edin., Medical Officer, Gold Coast, retires with a gratuity; St. George Gray, M.D., B.Ch.Dublin, Senior Medical Officer, Southern Nigeria, retires on pension.

New Appointments.—The following gentlemen have been selected for appointment to the Staff:—N. A. D. Sharp, M.R.C.S.Eng., L.R.C.P.Lond., Gold Coast; J. C. C. Hogan, M.D., B.Ch., B.A.O., L.M.Dublin, Northern Nigeria; J. A. Beattie, M.D., Ch.B.Aberdeen, D.T.M. and H.Cantab., Northern Nigeria.

Other Colonies and Protectorates.—W. W. Martin, M.B., Ch.B.Vict., J. W. Adams, M.R.C.S.Eng., M.R.C.P.Lond., M.B., B.C.Cantab., and J. London, M.B., Ch.B.Liverpool, have been selected for appointment as Medical Officers in the Straits Settlements; J. M. G. Ewing, L.R.C.P., L.R.C.S.Edin., L.F.P.S.Glas., has been selected for appointment as a District Medical Officer, St. Vincent; W. N. A. Paley, M.R.C.S.Eng., L.R.C.P.Lond., has been selected for appointment as a Medical Officer, Fiji; W. S. Coffey, L.R.C.P., L.R.C.S.Ireland, has been selected for appointment as a Medical Officer in the Federated Malay States.

INDIA OFFICE.

From March 1 to April 5.

Arrivals Reported in London.—Captain C. H. Barber, I.M.S.; Major Bhola Nauth, I.M.S.; Captain J. B. Christian, I.M.S.; Colonel G. W. P. Dennys, I.M.S.; Captain S. Haughton, I.M.S.; Captain D. L. Graham, I.M.S.

Extensions of Leave.—Captain R. E. Gamlen, I.M.S., 6 m.; Captain C. A. Gill, I.M.S., 14 d.; Captain G. C. L. Kerans, I.M.S., 6 m.; Captain L. Reynolds, I.M.S., 6 m., M.C.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Barber, Captain C. H., I.M.S.
Graham, Captain D. L., I.M.S.
Haughton, Captain S., I.M.S.
Nauth, Major B., I.M.S.
Taylor, Captain J., I.M.S., to May 7, 1913.
Watson, Major T. E., I.M.S.
Woods, Captain J., I.M.S.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Christian, Captain J. B., I.M.S.
Dennys, Colonel G. W. P., I.M.S., C.P.
Ross, Captain H., I.M.S., U.P., 24 m., November 20, 1912.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Journal of the Royal Army Medical Corps," No. 4, April, 1913, vol. xx.

Dengue.—Colonel Smith, D.S.O., believes that the dengue fever seen amongst the troops in Calcutta is identical with seven-day and three-day fever. He states that year after year the troops in Calcutta are attacked by a short fever which is productive of much inefficiency but no mortality. It has been returned as pyrexia of undetermined origin. This year, 1912, the author had the good fortune to have to deal with the disease personally and experienced an attack in his own person. Last year (1911) very careful notes of the disorder were taken under the direction of his predecessor, Lieutenant-Colonel T. McCulloch, R.A.M.C. From reading these notes and seeing the temperature charts, he (Colonel Smith) has no doubt that the fever of 1911 was the same as the fever of 1912. He is also confirmed in this view by officers who have seen the fever in both years. The conclusion arrived at is that the fever of 1912 is the same fever as that of many previous years, and is undoubtedly dengue. But the same fever has previously been called seven-day fever and three-day fever, so therefore seven-day fever and three-day fever are in reality dengue.

Seventh Report on Plague Investigations in India, January, 1913.

THE above report, which is published as a Second Plague Supplement of the *Journal of Hygiene*, contains the following papers:—

(xlviii) "Plague in Madras City" (with 1 chart); (xlix) "Statistics of the occurrence of plague in man and rats in Bombay, 1907-11"; (l) "The distribution of white-bellied *Mus rattus* in Bombay Island" (with 1 map); (li) "The immunity of the wild rat in India" (with 1 map); (lii) "Chronic or resolving plague" (with 1 chart and plate xv); (liii) "The experimental production of resolving plague in rats"; (liv) "Experimental plague epidemics among rats"; (lv) "Observations on flea-breeding in Poona" (with 7 charts); (lvi) "The serum treatment of human plague"; (lvii) "Attempt to separate the antigen from the nucleo-protein of the plague bacillus by filtration through gelatine," by Dr. S. Rowland; (lviii) "Besredka's method of vaccination," by Dr. S. Rowland; (lix) "The relation of pseudotubercle to plague as evidenced by vaccination experiments," by Dr. S. Rowland; (lx) Observations on the mechanism of plague immunity," by Dr. S. Rowland; (lxi) "The onset and duration of the immunity consequent on the inoculation of plague nucleoprotein," by Dr. S. Rowland (with 2 charts); (lxii) The opsonic index in plague vaccination," by Dr. R. St. John Brooks (with 5 charts); (lxiii) "The preparation of antitoxic plague sera," by Dr. A. T. MacConkey.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communication.

A REVIEW OF A CLINICAL STUDY OF MALARIA FEVER IN PANAMA.*

By JOHN PELHAM BATES, M.D.
Ancon, Canal Zone, Panama.

THE COURSE AND DURATION OF MALARIA FEVER UNDER THE ADMINISTRATION OF QUININE.

THE conclusions that are to follow in this series of articles have been deduced from a large general medical service in the two main hospitals of the Isthmian Canal Commission in Panama. The method by which these conclusions have been reached was to make a routine examination of the blood for malarial parasites of each patient when admitted to the hospital, regardless of what disease the patient might be suffering from, and to follow their clinical course until the patient was discharged from the hospital. The urine and fæces were also examined as a routine measure. Red and white blood-cell counts, differential counts, and hæmoglobin estimates were made if the nature of the case indicated. In addition to the clinical laboratory facilities for routine use in diagnostic purposes, the main laboratory of Ancon Hospital, bacteriological and pathological, was always at the service of the general staff, and I made the fullest use of this latter opportunity at all times.

In such a general work it was not possible for one to do all the detail work, but in my service I visited and examined each patient daily, or oftener when the nature of the case required. In order to avoid deducing conclusions from a too restricted class of patients, I made frequent comparisons between my results and those of others, in the different wards of the hospital, noting the different effects, if any, of race or colour.

After one has in this manner noted the clinical course of malaria fever in a large number of cases and over a considerable length of time, one will be particularly struck by the uniformity of its course, and the promptness of its subsidence under treatment by quinine; while this striking fact of its subsidence is being observed in cases amenable to treatment, it is also equally as noticeable that in those cases where the infection is too great to be affected by treatment in a given time, such cases are just as prompt in the opposite direction—towards death.

These phenomena one would naturally expect to be contradicted in some cases at least; in those, for instance, where the amount of quinine which could be administered would be about equal to the amount of the infection present, and under such circumstances one would infer that there would be a balancing between the two opposing forces, until sufficient immunity principles are evolved to finally terminate the course of the disease, and therefore the paroxysms would then continue over a considerable length of time.

Such a condition, however, never occurs, even under average treatment; there are then no long or lingering malaria fevers, nor are there any that approximate a period that could be in any sense termed continuant. In malarial countries it is also observed that there are no diseases which may not be, in their earlier stages at least, complicated by a superadded malarial infection; and, on the other hand, there are no malarial infections that may not have some underlying disease, either frank or cryptogenetic, to complicate its course. It becomes then extremely difficult at times to be certain just how far one is studying the clinical phenomena and course of malaria fever, or adding to them the phenomena of some other disease.

To do so with any degree of satisfaction it is necessary to have an abundance of material for comparative estimates, and laboratory facilities at hand or of easy access, for the final determination of obscure problems. I have been fortunate in having both, and shall in what follows give somewhat in detail the results of this study, and the practical conclusions according to my interpretation of the facts observed.

In order to follow up this review in proper sequence, I think it best to sketch in its general outline the accepted knowledge and teaching of malaria as found in the text-books in the latter part of 1905, the time I first began to note the points in the clinical phenomena of malaria which I thought were not quite in keeping with the ideas conveyed to me by such teachings.

In 1905, Marchiafava, Celli, Bignami, Bastianelli, Golgi, Osler, Manson, Ross, Thayer, Mannaberg, and many others not without due influence, were the most powerful factors in shaping our ideas of malaria in America. They, with many other painstaking workers, had followed the life cycle of the malarial parasites both in the human organism and in the mosquito; they had differentiated the different morphology between the varieties of parasites, classified them in zoology, and given their biological characteristics; drawn and tabulated them in such a way that any worker after a little experience could follow them. They had put upon a sure basis the mosquito theory of the transmission of malaria between man and man, and defined the varieties of mosquitoes; and they in the meantime had followed the clinical course and symptoms of malaria, and described its characteristics accurately up to a certain point, where there arose some considerable divergency of opinions.

This point of divergence arose over certain symptoms of the malaria fevers, and the effect of quinine on the duration of the fever in particular infections, notably the æstivo-autumnal, and upon the resistance of the æstivo-autumnal parasites to quinine. These, then, being the points over which most of the confusion arose, I shall here examine some of the different views as then held, without any particular comment, and take them up later on, together with the management of the case, and the dosages of quinine advised by each; and seek to explain some of the reasons for these various ideas, as those reasons appear to me. The course of the

* Read before the eighty-fourth meeting of the Canal Zone Medical Association, March 15, 1913.

fever and its duration and its susceptibility to treatment, among the most accepted authorities, were, to quote briefly, as follows:—

Thayer [1], after stating that the malaria fevers were usually very amenable to quinine, and speaking further of the æstivo-autumnal fevers, says:—

> Certain of these cases may pursue a course quite similar to typhoid fever through some days, or even weeks. To these cases Baccelli has given the name "subcontinua."

Osler [2], in describing the æstivo-autumnal fever, states that the

> Fever may be continuous with remissions more or less marked. . . . In some the fever subsides at the end of the week, and the practitioner is in doubt whether he has had to do with a mild typhoid or a simple febricula. In other instances the fever persists from ten days to two weeks; there are marked remissions, perhaps chills, with a furred tongue and low delirium. . . . It is under this form of malaria fever that so much confusion still exists. . . . The fever yields, as a rule, promptly to quinine, though here and there cases are met with—rarely, indeed, in my experience—which are refractory.

Scheube's [3] view of the æstivo-autumnal fever is decidedly more discouraging, as he says of it:—

> The period of the duration of remittent fever fluctuates between three days and three weeks, sometimes it even lasts longer. . . . Quinine usually has but little effect on remittent fevers, and good results are not obtained immediately even on a change of climate.

I think it fair here to let Scheube speak his views on the dosage of quinine, in which he says:—

> As regards the dose, the administration of small occasional doses has now been quite relinquished in favour of a single larger dose at longer intervals. In mild forms 1 grm. is the usual dose for adults; in serious forms 1 to 2 grm. are administered. Experience has taught us that it is useless, and may prove dangerous, to exceed this quantity.

Manson [4], in describing the æstivo-autumnal fevers, speaks as follows:—

> A modification of the bilious remittents—what Kelch and Keiner call typhoid remittent—is very much more grave as affecting life than the simple bilious remittent.
>
> In the typhoid remittent, typhoid symptoms, such as low delirium, prostration, dry tongue, swelling of the spleen and liver, subsultus tendinum, marked melanæmia, are superadded to the usual symptoms. . . . The quinine test is generally conclusive in intermittents and in the various larval forms of malaria, but the more severe remittents are often singularly resistant to the drug. Moreover, time may not be available in which to test such cases with quinine.

Manson's statement that the more severe remittents are singularly resistant to the drug, followed by the qualification that time may not be available in which to test these cases with quinine, can with propriety be interpreted in two ways. First, that the fever cannot be controlled by quinine, and from the clinical description of them one could expect them to continue over a considerable length of time. Or, from the qualifying remarks one may infer that these symptoms had arisen from neglect of treatment, and death was so near that quinine would now be useless. I prefer to take the latter interpretation, as he states further on:—

> The quinine may not always prevent the next succeeding fit, but it nearly always diminishes its severity. In ninety-nine cases out of a hundred the second following attack does not develop.

Marchiafava and Bignami [5], who had made such a long and careful study of malaria, have not allowed themselves to be confused about these fevers. They go directly to the point without hesitation, and tell us what to expect about their duration:—

> Their duration depends nearly always upon the treatment; if the specific remedy be promptly administered, the fever usually remits with promptitude, or it may intermit, to resume again for a short time, and terminate definitely. Thus their duration is usually four, five, or six days, or a week at most.

They did, however, encounter some cases that did not pursue this uniformity of course and duration, and refer to them as follows:—

> We have already spoken of the duration of the fever, stating that when it is properly treated it does not last more than five or six days. But sometimes cases occur in which, in spite of the administration of quinine and the decrease or disappearance of the parasites, the fever continues for two, three, or even four days longer, with a progressively milder course.

Mannaberg [6], in discussing the subcontinued type of fever, states:—

> The fever-curve of a subcontinued fever, for one or two weeks, will sometimes show the original type, whether tertian or quartan, though in the majority of cases this is not decisive. In addition to spontaneous temperature fluctations, which are difficult to recognize, there are others due to quinine (administered necessarily from the beginning).

It would be useless, I think, to continue this review any further, as all will be found more or less similar. With the exception of Marchiafava and Bignami, and Osler to some extent, and perhaps Manson, it will be seen that malaria was held to be a somewhat variable entity, and variable in its manifestations. Most usually it would yield promptly to quinine, but again it would be extremely resistant, and continue for weeks in spite of the administration of the drug, to end in recovery, and sometimes in a long and tedious convalescence. In the midst of such manifestations, if the descriptions are followed further, pernicious symptoms might arise, and these in turn manifest characteristics equally as variable as the course and duration.

Naturally I held these same views with regard to malaria, and in a country, then, like Panama, where the name of malaria was held as a scourge—the dread pernicious of the French, and the even more terrible "Chagres fevers" were to be met with—one naturally expected to contend with malaria in all of its infinite forms.

As to the matter of the severity of these fevers, my apprehensions were fully realized; the admission of cases already in coma was not unusual; the sudden onset of pernicious symptoms a few hours after admission was also not uncommon, and grave cases without pernicious symptoms were always present. But as to the duration and course of these fevers, I was not a little surprised to note that not even the gravest of those which recovered showed a duration or course comparable to the description of the grave malarial fevers quoted above. (These statements apply to the beginning of our work in Panama in 1904, 1905, and 1906.)

The most of the malaria fevers terminated in from two to three days, the tertian subsiding sometimes with an elevation of temperature on the third day, and the æstivo-autumnals with a lessening rise of fever each day, or with a prolonged paroxysm; this final paroxysm beginning on the second or third day, and lasting from twenty-four to sometimes even forty-two hours, and thus terminating its course.

With the exception of the deaths from the pernicious fevers, and the consequent interesting autopsy, and a normal number of blackwater fever cases, it was rare that anything occurred to break this clinical monotony.

There were also observed quite a number of fevers in which routine blood examination proved negative for malarial parasites. The clinical symptoms in most of these negative cases were so characteristic and their duration so short that they could not be other than malaria. But among these negative fevers it was noted that now and then some of them continued for from ten to fourteen days or even longer under the usual doses of quinine. In not all of these latter continued fevers, however, was the blood examination negative, for in very rare instances, indeed, parasites were found in these also.

I was diagnosing all these fevers, including the continued fevers, malaria. Those without parasites "clinical" malaria, and those with parasites malaria under the different classifications according to the variety of parasites disclosed under the microscope.

This much already noticed, I was becoming a little interested in what appeared to me to be an exceptional course or duration of tropical malaria, and also somewhat curious about these mild fevers that were mostly negative for parasites—although I grant that in mild early malarial infections parasites are difficult to find, and perhaps I had missed them.

I began to be curious also why it was that all the positive malaria cases responded so promptly to quinine, and why the greatest majority of the negative fevers did the same, and yet a few of these negative fevers did not do so, but as I have said, continued from ten days to two weeks.

Just at this time (December, 1905) there occurred a case with blood negative for malarial organisms, and with a sub-continuous fever and an enlarged spleen and liver, a fever that I was unable to classify under any head. This man died, and at autopsy Dr. S. T. Darling [7] found bodies resembling the Leishman-Donovan bodies of kala azar, which he has since named *Histoplasma capsulatum*. This special fever I thought, then, was a clue to the indefinite fevers of one to two weeks' duration which I have just referred to, and that they would prove to be the earlier stages of something similar to kala azar. Acting on this impression, I began watching for more of these mild fevers, and a little later was able to select one. This patient had a slight fever with no specially marked symptoms, he was allowed the run of the wards, and almost a full diet. The only watch kept of him was a careful record of the temperature, and a daily examination of the spleen for enlargement. About the twentieth day after his admission the temperature rose in the afternoon to 103° F., the following morning it remained elevated, and by the afternoon it had risen to 104° F., at which point it remained fairly constant for six days, when the patient died. The autopsy in this case disclosed the lesions of typhoid fever at the beginning of the second week.

These two widely different diseases following so closely on the heels of each other, confused me somewhat, and I was at a loss for a while to know what course to pursue. But inasmuch as there were occurring a number of well marked typhoid fevers in my wards at this time, I at last concluded these indefinite fevers I was meeting with were most likely typhoid, and on this assumption began work along that line. I at that time had but little knowledge of mild typhoid fever. Osler [8] had described these indefinite fevers as typhoid fever, and quoted some of Dock's work along the same lines. Victor C. Vaughan [9] had brought out his admirable paper on the spread of typhoid fever during the Spanish-American War, and concluded that a large number of cases diagnosed malaria must have been typhoid fever in a mild form. Our laboratory* was only equipped at that time for Widal tests. However, I commenced the work in the following manner. In all cases of fever admitted with blood negative for malarial parasites, and which showed no other obvious cause for the fever, a routine series of Widal tests were made every other day throughout the patient's stay in the hospital, unless a positive test was returned earlier. During the year 1906 and to September, 1907, [10], two hundred cases of typhoid fever were collected in this way in my own service, in which 33 per cent. of them were of short duration.

In the latter part of 1907 our laboratory was equipped for blood culture work, and I continued this study of the mild fevers with blood cultures, though our typhoid epidemic was now under control and well toward its end. As in the Widal work, every fever in which the cause was not clear, a culture was asked for on the *first* or the *second day* after the patient's admission; and in some, where the blood smears were positive for malarial parasites, cultures were also made. Working in this routine manner, a large number of cultures were made which, of course, were useless, but it enabled me to pick up some of the *milder cases of typhoid which would have been impossible if time had been taken to attempt a differentiation.*

This work was ended in August, 1908. During this time sixty-eight cases of typhoid fever were collected. In thirty-seven of these sixty-eight cases the blood cultures were positive for either *Bacillus typhosus* or its kindred strains. Of the thirty-seven positive typhoids nine were of the short

* I am indebted to Dr. Samuel T. Darling, Chief of Laboratory, for his assistance and encouragement in this entire work. He and his assistants in the laboratory, chief among whom was Dr. Thomas R. Brown, made this work possible by their enthusiastic support and prompt answering to every call for blood cultures and Widal tests.

duration variety, the fever terminating in a total of eight to fourteen days. In this small series of cases 7 per cent. had a superadded malarial infection, but curiously enough not any of the short duration cases showed any evidence of malarial infection, as I had seen in my earlier work with Widal tests. Since this time, however, Dr. W. M. James has kindly furnished me with a chart of an American patient whose blood culture was positive and the smears from his peripheral blood disclosed tertian malarial parasites. (See Chart III.)

During the time of this work over eight thousand cases of malaria had passed directly under my observation, and nothing had transpired in all these cases to disturb the first impressions made on me in reference to the course of malaria at the beginning of the work; in fact, this mass of cases served only to confirm those first impressions. I have analysed several thousand malarial charts in my own wards and in other wards of Ancon and Colon hospitals. (The charts of 1904 and most of 1905 have been excluded because we were all rather new at malarial blood work, and as new beginners will be, were over zealous in our findings.) I separated them into nationalities and different races with regard to colour, and it has all been the same thing as to the duration of the fever under proper treatment.

In the analysis of this large number of charts it was found that the fever subsided in one day, two days, three days, or a number at four days; occasionally it was the fifth day, and very rarely an afternoon's rise to 99° or 100° F. on the sixth day.

This uniform course led me in 1907 to state as an axiom, any fever that did not yield to quinine in five days was not malaria. This did not mean that a malaria fever was likely to continue for five days nor anything like five days, but it might in some instances do so. Then if a fever should continue for more than five days, with quinine properly administered, there was something else other than malaria the cause of its continuance.

But before going any further into this phase of the subject, I think it best to digress a little until we have examined the opinions of some of the later writers on the course and duration of malaria.

The writers for the current medical magazines have given considerable attention to malaria in the past seven years, in its numerous points of interest, but little or no notice of its course or duration under treatment. It is necessary then to again return to the later text-books for this least interesting but most practical side of the subject. The first of these I shall refer to is Rogers [11], who, in speaking of the duration of malaria fever under proper treatment, states that the duration of malaria fever is about four days, and further adds:—

> It may therefore be laid down as an axiom that any fever which lasts longer than the time limits stated, under proper doses of quinine, is not malarial, or at least not purely malarial in its nature.

Deaderick [12]:—

> A fever that resists quinine is not malaria fever. The maximum period of resistance to quinine is ordinarily stated as four days.

After which he describes a post-malaria fever, particularly in æstivo-autumnals if the infection has lasted for some time, in which he states the fever persists for weeks uninfluenced by quinine. The blood examination is negative for parasites. He then offers several explanations as to its cause, but states that none of these are satisfactory.

Craig [13] in his description of the æstivo-autumnal fevers, states:—

> **If properly treated, the symptoms are easily controlled within a week, although in very rare instances the plasmodium may be very resistant to quinine and persist for eight to ten days.**

As to the administration of quinine, he advises that 40 gr. of quinine a day *never* be exceeded, and believes that 2 grm. administered in divided doses in each twenty-four hours is amply sufficient to cure any ordinary case of æstivo-autumnal infection.

Castellani and Chalmers [14] of the later writers are rather hopeless in their outlook for the cure in the æstivo-autumnal fevers, and say:—

> **It is generally stated that a fever which within four days is not influenced by quinine in full doses is not malaria. This is true as regards malaria fevers due to the quartan and tertian parasites, but not always as regards those caused by the subtertian parasites. We have met with cases in which *the fever has remained unaffected while the parasites can be found in the peripheral blood, notwithstanding several weeks' quinine therapy by various methods.****

It is difficult to know just what comments to offer on these statements of Castellani and Chalmers with regard to finding parasites in the blood of the periphery, "notwithstanding several weeks' quinine therapy by various methods." I should like to reconcile this statement, so contradictory to the experience of all other workers in malarial blood work, by the doses of quinine being too small. But they recommend 5 to 10 gr. of quinine three times a day for ordinary malarias, which I think is quite sufficient to destroy the parasites to a number so low that it would be extremely difficult to find them in the peripheral blood. For severe cases they recommend 10 to 15 gr. by the hypodermic method, though not specifically stated, I presume at least three times a day. This also would be sufficient to destroy the parasites in severe cases, "below the detectable limit" in the blood of the periphery. Thirty grains a day did so in Ross's and Thomson's [15] case of relapse. Perhaps it is just as well to call the attention of Castellani and Chalmers to these few facts, and leave them to explain.

Brem [16], in speaking of the duration of the fever in malaria and the quinine test for the diagnosis, states that:—

> Even in Colon Hospital, where routine examinations of the blood are made, and where routine blood cultures are taken in all undiagnosed fevers continuing for more than three days, we have sometimes been left in doubt. As a rule, then, in first attacks four days is sufficient for the test, and six days is a maximum time to be allowed it.

From my experience with blood culture tests in the mild typhoid fevers, three days is too much

* Italics mine.

delay if one expects to dispel one's doubts by cultures from the blood. I have found it necessary to have the cultures made within *twenty-four* to *thirty-six* hours after admission if one is to have satisfactory results.

Patients with this class of fevers have already delayed coming to the hospital from two to ten days. It is well understood that blood cultures must be taken early to get the best results, in even severe typhoid. In this class of fevers positive cultures are rather uncertain at best; and it therefore becomes necessary in some of the cases to base the diagnosis on symptoms or complications that are characteristic of other typhoid fevers, as we sometimes have to do in some of the mild malarial infections without being able to determine parasites in the blood of the periphery.

In our inquiry into the opinions of the various writers on the subject of the duration of malaria fevers, especially the æstivo-autumnal fevers, we see a mass of ideas more varied than in any other disease. It is to be noted, however, that most of the writers since 1905 are placing the duration of malaria fever within decidedly more circumscribed limits.

A number of reasons have been offered why malaria should be so varied in its duration under treatment. As I understand them, these reasons are as follows: (1) Varieties of parasites that are inherently resistant to quinine; for instance, the subtertian æstivo-autumnal parasites, as stated by Castellani and Chalmers; (2) at times the condition of the patient is such that quinine cannot for the time being act efficiently in the circulating fluid; (3) "fastness" of the parasite or "effective resistance" to quinine; and, finally (4) it was formerly assumed that there was some peculiarity about the virulence of tropical malaria, and this accounted for some of the discrepancies in the views about its duration. I do not think either of these reasons are satisfactory. I have not seen either the one or the other hold good in the malaria fevers of Panama. One can either get enough quinine into the circulation to destroy the parasites, to a number sufficiently low to relieve the paroxysms, or one cannot. In the latter event death is always the result; in the former, which fortunately is usually the case, the relief is always decided and rarely requires more than three, four, or five days.

In the beginning of this review of the literature on malaria, I expected to be able to reconcile some of these discordant ideas, by perhaps the too timid administration of quinine. I find, however, I cannot very well do this, for with the exception of Scheube, who makes 15 gr. a day an average dose, and 30 gr. a day a maximum dose, there is a remarkable uniformity of opinion that 30 gr. is a small enough dose for average cases, and all are agreed that in severe cases the dosage should be increased. This seems to me to be in most instances sufficient dosage.

I am then forced to seek some other reason. I have already spoken of the fact that in malarious countries there are no diseases which may not be, in their earlier stages at least, complicated by superadded malarial infection; and on the other hand there are no malarial infections that may not have some other underlying disease, either frank or cryptogenetic, to complicate its course.

It would be unreasonable to assume that such careful observers as are quoted here could have been led into any errors by the frank complications. Then if we must account for these discrepancies—and we must, for all cannot be correct—it must be done under the cryptogenetic diseases, *or what were obscure diseases* at the time that most of these writers were making their studies.

The obscure diseases, that is, obscure with reference to their relation to malaria, and which have had the greatest influence for evil in shaping our views erroneously, I think are three: First, kala azar; second, typhoid fever; third, uncinarial anæmia and its consequent irregular fever.

Uncinarial Anæmia.—The secondary anæmia of uncinarial infection is attended by a rather variable and irregular fever. Most of the subjects of uncinariasis have been also infected with malaria, and often come under observation to be treated only for the malaria. Unless routine stool examinations are made, one is most likely to overlook the principal cause of the fever—the uncinariasis—and attribute all the symptoms, the anæmia and the irregular fever, to a malarial infection. This has no doubt been frequent in the past, and in this manner given rise to the descriptions of a so-called post-malaria fever. Hirsch [17] points out that uncinarial anæmia was always looked upon as malarial cachexia until about 1885. These two infections are present in the same individuals in a very large percentage of natives in the Tropics, and they cannot be separated unless the stools are examined as well as the blood. I shall discuss the uncinarial anæmias in a more appropriate place under the head of the grave malarial anæmias.

Kala Azar.—According to Rogers [18], kala azar was first noted in 1882 by Dr. Clark, and described by him as a very severe form of malarial cachexia. Throughout the years that followed up to 1902 kala azar was looked upon by the medical men in India as a severe form of malarial infection, attended with chronicity, enlarged spleen and liver, and with usually a fatal termination, and only slightly, if at all, affected by quinine. In 1903, Leishman and Donovan [19] announced their discovery of the parasite of kala azar, without at that time being able to classify it. Leishman first thought the parasite was a degenerate form of a trypanosome.

Since this discovery numerous investigators, principally Rogers, have been studying the disease, and through their combined labours kala azar was shortly placed as a disease *sui generis*, as was suggested by Manson at a little earlier period.

The symptoms of kala azar are those *in toto* of a chronic *untreated* malarial infection, namely, an acute onset of fever, more or less irregular, sometimes marked remissions to be followed by sharp exacerbations. During this attack the spleen becomes enlarged and the liver also. According to

Bentley [20] and Rogers [21] this attack may last from two to six weeks, to be followed by a period of apyrexia. Repeated accesses of fever occur from time to time and splenic enlargement becomes permanent. With each recurring febrile attack the anæmia becomes more marked, until, with the enlarged spleen and pronounced anæmia, the patient is a complete clinical picture of chronic, *untreated* malaria. Moreover, according to Manson [22] malarial infection may be a frequent complication of kala azar.

The mere statement of these brief facts is sufficient to explain the relation of kala azar to malaria in the descriptions of the malaria fevers of the Tropics: the long continued malaria fevers unchecked by quinine, and not immediately benefited by a change of climate. Although kala azar is now fairly easily diagnosed, the evil effect of these old descriptions is still present, at least to some extent, in our interpretation of the malaria fevers.

Typhoid Fever.—When stating the original proposition that underlying diseases, especially the cryptogenetic ones, must account for the discrepancies in the views about the course and duration of the malaria fevers, typhoid fever was placed in this latter class. However, it must not be inferred that I mean that typhoid fever as a distinct entity is in any sense cryptogenetic, but obscure only in some of its many phases in its relation to malaria fever.

Typhoid fever has always borne a rather intimate relation to malaria, especially in the matter of the differential diagnosis of the one from the other. This fact, I think, makes it necessary to inquire into typhoid fever and its relation to malaria fever at some length.

Manson [23] and Rogers [24] call our attention to one fact which I think has considerable influence even to this day on the ideas of the course and duration of malaria. They state that it was long held, and up till very recent times, by the English and French surgeons in India and Africa, that typhoid fever did not occur in either of these countries. Rogers states, however, that the English surgeons recognized typhoid fever in Europeans residing in India and Africa (since 1854—Scriven), but they did not believe it occurred in natives.

Therefore all or nearly all of the continued fevers of India and Africa were looked upon as malarial in nature, and they were classified as malarial under such terms as "continued," "remittent," and "bilious remittent" fevers. At a somewhat later date many good observers thought that typhoid infection and malarial infections never occurred simultaneously in the same individual. This latter contention was being discussed, particularly during the years of the period of the greatest advance in malarial knowledge, that is, from 1882 to 1900. Hence, when the two infections did co-exist the symptoms of the one or of the other of these two diseases must necessarily have crept into the clinical descriptions. And particularly into the descriptions of malaria, for the symptoms of that disease can be more easily obscured by typhoid fever than the symptoms of typhoid fever can be obscured by malarial symptoms.

Laveran himself and Boudin [25], with many others, held that there was an antagonism between the two infections, and from this antagonism one infection would preclude the other. Marchiafava and Bignami [25], while not denying the co-existence of the two infections, state that in their experience they and many others had never seen the occurrence. At about this time Thayer and Barker [26] found that the two infections were present simultaneously in the same individual. Since this important contribution to our knowledge of these infections there is no longer any question of the co-existence of the two, and moreover it is a well-established fact that typhoid fever occurs in all portions of the world.

Kelch and Keiner [27], while working in Algeria, described a malaria fever which they called bilious remittent fever, in which all the clinical features of a well-marked typhoid fever are present, such as low delirium, subsultus tendinum, &c.

Marchiafava and Bignami [28] also describe a malaria fever as typhoid subcontinuous, in which every sign of typhoid fever is present, even to the rose spots, "in a word, a complete clinical picture of typhoid fever."

In malarious countries, with people living in highly infected localities, it is not infrequent to encounter *untreated* cases of malaria, in first attacks or acute recurrent attacks which have continued for several days. In this class of cases the appearance of the patient when first seen presents many of the symptoms that strongly suggest typhoid fever in the stage at the latter part of the first week, or at the beginning of the second week, and the practitioner will be in doubt for a short time.

At this point though all similarity ceases between the two diseases. If the fever is due to malarial infection alone, even indifferent treatment will ameliorate the symptoms to such a degree that it will in a brief period no longer resemble typhoid fever, and if the treatment is active and vigorous the fever is cut short promptly. While, on the other hand, if the fever is due to both malarial and typhoid infection co-existing or to typhoid infection alone it pursues a course unchecked, in spite of any amount of quinine, and takes on all the characteristics of typhoid fever within the limits of the gravity of the infection. It appears to me that one of the most important points in the study of malaria has been largely overlooked, *and that point is, that malaria has no analogue in any other infectious disease.*

If, then, one undertakes to deduce any given facts about malaria by analogy from any of the other infectious diseases one is likely to be led up to erroneous conclusions. We know that with the exception of pneumonia the duration of the infectious diseases is largely dependable on the gravity of the infection. But this is not the case in malaria when under treatment. We possess a specific remedy for malaria which does not allow it to

pursue a normal course, as other infectious diseases necessarily do in the absence of a more than relative specific remedy.

In the cases I have encountered in which the symptoms present were typhoidal in character, such as low delirium, subsultus tendinum, rose spots, &c., these symptoms persisted, and the ultimate findings by Widal's test or blood-culture methods proved the greatest number of such cases to be typhoid or allied fevers. In the few instances where one or the other of these tests failed to conclude a positive diagnosis, one could, by analogy, without any great difficulty conclude that the remaining cases were also typhoid fever.

Now it must be remembered, and it is the main point at issue, I think, that all typhoid fevers do not display positive Widal reaction while under observation, nor will they all yield a positive blood culture, with one single culture at least, and that the negative cultures will *pari passu* increase with the mildness of the disease. Just as in malaria the milder cases fail to disclose malarial parasites in the blood of the periphery, in frequent instances under routine blood examinations. With these facts made clear, we can readily account for the so-called malarial fevers which may continue from three days to three weeks, or for those that may continue for weeks even after parasites have disappeared from the blood of the periphery. Such fevers as these I conclude must be something other than malaria. And those that have been classed as malarial with a complete clinical picture of typhoid fever, I must be permitted to assume were typhoids which in the beginning disclosed malarial parasites in the blood of the periphery, and later failed to yield a positive culture or return a positive Widal.

It appears to me that such a conclusion is the logical one, especially as the long duration or moderately long duration malarias occur so infrequently as to cause two of our writers to offer more or less qualifying statements when describing them or noting the effects of quinine.

One of these is led to state that " here and there cases are met with—rarely, indeed, in my experience—which are refractory " [29]. The other, that " quinine may not always prevent the next succeeding fit, but it nearly always diminishes its severity. In 99 cases out of 100 the second following attack does not develop."

An analysis of one hundred or two hundred charts of malaria fever, with positive blood findings, will amply justify these qualifying statements just alluded to. Then, when an occasional fever does occur which will not obey the law of the ninety and nine, the inference ought naturally to be that the incorrigible one is not wholly malarial in nature.

We come now to the discussion of the short duration, or atypical typhoid fever. This is the most difficult part of the problem, the differentiation of the short duration fevers from true malaria. The differentiation would be, in most instances, of little or no moment so far as the patient's welfare is concerned, but it becomes of utmost importance from the standpoint of preventive medicine. It is not, however, wholly a negligible matter to the patient, for accidents can arise in these mild fevers, and relapses that are severe can also occur, either of which might be prevented if the nature of the disease is known and the proper precautions taken.

I have already stated that at the beginning of my service here I had had but little knowledge of the mild typhoid fevers. I recall with some interest now that just a few years before this time the medical men of the Southern portion of the United States were discussing a " third fever," one which they thought was intermediate between typhoid fever and malaria; and how accurate some of the descriptions of this third fever were, of the symptoms and the duration of what we now know to be mild typhoid fever. These discussions were carried on under different names for the " third fever," such as " X fever," " toxintericus," and finally one man put it " fever, just fever."

In the United States, as I have said, Osler [29], Dock, Vaughan [30], and one or two others have recognized and described the atypical typhoid fevers. Curschman and Osler [31] had given considerable space to them in 1902, but these writers did not seem to make the impression on the profession at large that the importance of the subject warranted. In 1907, McCrae [32] again called attention to these mild typhoid fevers, and discussed them at length, with apparently no better result than Curschman and Osler. For medical men at large at that time expected, as a rule—and some do expect yet for that matter—of typhoid fever, a week of slow rise of the fever, the one to two weeks' fastigium, the rose spots, the meteorism, the distended belly, the delirium, &c., and finally the slow decline of the febrile curve.

The evidence for the short duration fevers as described by McCrae and Osler was based on Widal reactions, which could in a measure be doubted when one for reasons of his own wished to do so, on the grounds that the patient had had typhoid fever some time in the past and that the Widal reaction was the result of a past infection.

But with the perfection of the cultivation of the bacilli from the blood-stream no such argument could be made. Koch [33] and his co-workers in 1904, employing the blood-culture method, worked out a number of these mild fevers, and established their typhoid nature. Drigalski [33] at the same time by stool and blood cultures also was able to ascertain unquestionably that these mild fevers were due to typhoid infection. Rogers [34], in India, worked out these same fevers by blood cultures, and found them caused by *B. typhosus* and kindred strains. In 1909 [35] I published the results of my blood-culture work on these fevers which was begun in 1907, and confirmed my own ideas about these short duration fevers, as well as the work of the foregoing writers. After my work was broken off in 1908, Deeks [36] took it up, and reported his findings in 1909, confirming all of my previous work.

Warren Coleman [37], who must have been working at these fevers about the same time that I was with blood-culture methods, published his

results in 1909, establishing the fact that the short duration fevers existed in the United States also. Since that time the work has apparently lapsed, but sufficient work by culture methods has already been done and reported from widely separated sources to establish beyond peradventure that typhoid fever, like any other infection, varies between cases so mild as to be perhaps unrecognizable by any methods to those so severe as to cause death in a few days.

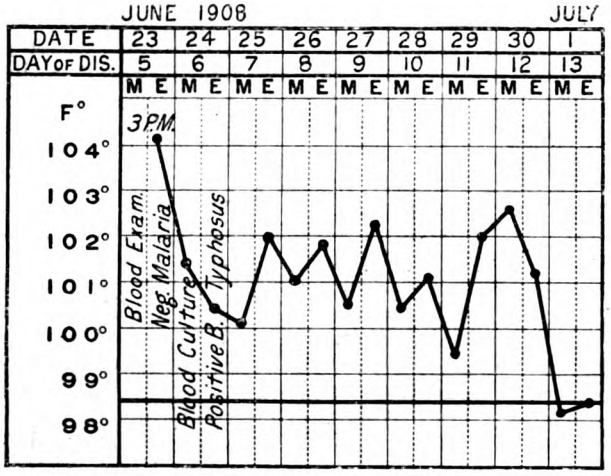

CHART I.—Typhoid fever with a temperature curve markedly similar to malaria fever. Cultures from blood positive *B. typhosus*. No malarial parasites found in the blood of the periphery.

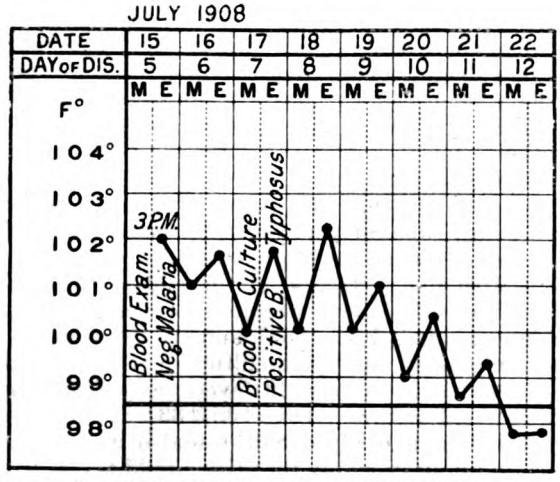

CHART II.—Typhoid fever with a temperature curve fairly characteristic of the short duration typhoid fevers. Cultures from the blood-positive *B. typhosus*. No malarial parasites found in the blood.

The question of the nature of these intermediate fevers settled, it now remains to try to explain their relation to the cause of the belief of the slightly prolonged duration of malarial fever. It will be noticed by referring to Charts I, II, and III, or any description of the mild typhoid fevers, that the temperature curve is often irregular, and corresponds very closely to the description of the remittent or subcontinuous type of malaria fever. Some typhoids of moderate severity terminate abruptly as malarial fevers often do, and at least some of these typhoids have malarial parasites in the blood along with the typhoid infection.

With these similarities between the two diseases in view it becomes at once obvious how such fevers as these can be mistaken for malaria. In fact, when one is not familiar with the mild typhoid fevers, the only conclusion left is that they are malarial, especially as an occasional one of them may exhibit malarial infection present also.

After a separation of these mild typhoid fevers by blood cultures from malaria, I think it will explain why some of the later writers found a few of the latter continuing during quinine treatment for a period of eight to ten days; and how Marchiafava and Bignami [38], otherwise so correct in their conclusions about malaria, must have been deceived by these same mild typhoid fevers when they refer to some cases occurring

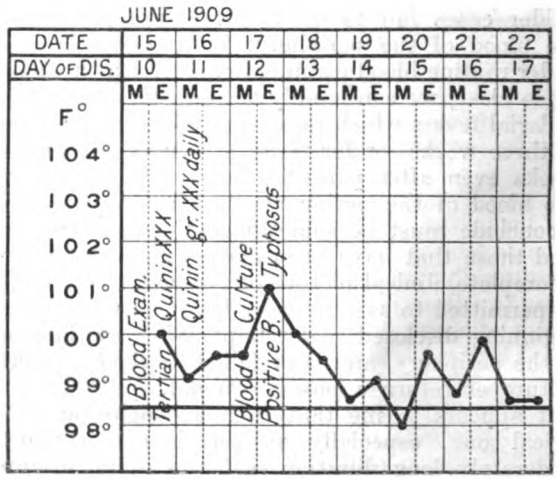

CHART III.—By courtesy of Dr. W. M. James. Typhoid fever. Cultures from the blood-positive *B. typhosus*, and in which the tertian malarial parasites were found in the peripheral blood also.

" in which, in spite of the administration of quinine and the decrease or disappearance of the parasites, the fever continues for two, three, or even four days longer, with a progressively milder course."

I have here shown that all the fevers occurring in Northern Africa and in India, up to within quite recent times, were looked upon as malaria and described as malaria fever. And I have further shown that during the period of the greatest progress in malaria knowledge, the co-existence of malarial infection and typhoid infection was disputed, and in this manner, when the two infections did co-exist, it was the typhoid symptoms that were described and not the malarial, as malarial symptoms were masked by those of the typhoid, or promptly jugulated by quinine.

In the present review I have related the early causes which led me up to certain conclusions with regard to the duration and course of malaria fever; I have also related some of the methods by which

I have been able to exclude the milder typhoid fevers from confusion with malaria, and these methods in turn have led me to various kinds of detailed work which have enabled me to exclude numerous other diseases from being confused as malaria, until I have found true malaria to be a very simple entity, and neither complex in its manifestations nor difficult to cure if it is taken before the human organism is overwhelmed by the infection.

It is found also that malaria fever has no analogue in other infectious diseases (that is, the greater the infection the more prolonged the course), but that it either responds to the specific remedy with promptitude or rapidly terminates in a fatal issue.

By this detailed inquiry into the three diseases, uncinarial anæmia, kala azar, and typhoid fever, I have shown that these diseases have very great similarity in their clinical symptoms to malaria, and thus have offered the greatest difficulty in differentiating them from that disease; that two of these were for a long period regarded as wholly malarial, and that one of them, typhoid fever, in many instances was also looked upon as malarial. In this detailed study I have undertaken to show how these three diseases have been responsible for the idea that malaria could be in most instances readily amenable to treatment, and yet in other instances be only slowly influenced by quinine.

To do this it has been necessary to assume that the resistant cases were not malaria, but were one or the other of the three diseases alluded to above, or some other disease confused in the same manner. I think that in the exposition of the facts as herein set forth I am amply justified in this assumption. I may then conclude that malaria is a simple entity, and in the majority of cases readily amenable to treatment. That when it is efficiently treated the paroxysms can be controlled in from three to four days. In a few instances primary infections, as was pointed out by Marchiafava and Bignami [39], may be a little stubborn, and it is also the case with children, but these cases will slowly subside on the fifth and sixth days after treatment is begun.

The occasional case that cannot be affected by the specific remedy will rapidly terminate in a fatal issue.

[I wish to thank Colonel W. C. Gorgas, Chief Sanitary Officer, for permission to publish this paper.]

BIBLIOGRAPHY.

[1] THAYER, WM. S. "Lectures on the Malarial Fevers," 1897.

[2] OSLER, SIR WM. "Principles and Practice of Medicine," pp. 20-21, fifth edition, 1908.

[3] SCHEUBE. "Diseases of Warm Countries," p. 125, 1902.

[4] MANSON, SIR P. "Manual of Tropical Diseases," revised, pp. 78-148, 1903.

[5] MARCHIAFAVA and BIGNAMI. "Malarial Fever," pp. 323-326; *Twentieth Century Practice of Medicine*, vol. xix, 1901.

[6] MANNABERG. "Malarial Diseases," p. 274; "Nothnagel's Encyclopædia of Medicine," 1905.

[7] DARLING, SAMUEL T. "Histoplasmosis: A Fatal Infectious Disease found among Natives of Tropical America," *The Archives of Internal Medicine*, September, 1908.

[8] CURSCHMAN and OSLER. "Typhoid and Typhus Fevers," pp. 293-302; "Nothnagel's Encyclopædia of Medicine," 1902.

[9] VAUGHAN, VICTOR C. "Conclusions reached after a Study of Typhoid Fever among the American Soldiers in 1898"; Oration on State Medicine, *The Journal A.M.A.*, p. 1451, June 9, 1900.

[10] "Atypical Typhoid Fever: Its Part in Preventive Medicine and Its Differential Diagnosis from Estivo-Autumnal Malaria," *The Journal A.M.A.*, vol. l, pp. 585-590, February 22, 1908.

[11] ROGERS, L. "Fevers of the Tropics," p. 218, 1908.

[12] DEADERICK, WM. H. "Practical Study of Malaria," pp. 194-195, 1909.

[13] CRAIG, CAPTAIN CHARLES F., U.S.A. "The Malarial Fevers," pp. 253-254, 1909.

[14] CASTELLANI and CHALMERS. "Manual of Tropical Diseases," pp. 670-678, 1910.

[15] ROSS and THOMPSON. "A Case of Malaria Fever showing a True Parasitic Relapse during Vigorous and Continuous Quinine Treatment." *Annals of Tropical Medicine and Parasitology*, vol. v, No. 4, February, 1912.

[16] BREM, WALTER V. "Studies of Malaria in Panama." "Clinical Studies of Malaria in the White Race." *Archives of Internal Medicine*, pp. 646-661, vol vi, December, 1910.

[17] HIRSCH, ADOLPH. "Handbook of Geographical and Histological Pathology," pp. 313-327, vol. ii, 1883.

[18] ROGERS, L. "Fevers in the Tropics; Kala Azar," pp. 31-47, 1908.

[19] Cited by MANSON, "Manual of Tropical Diseases," 1909.

[20] *Idem.*

[21] ROGERS, L. "Fevers in the Tropics," pp. 31-47, 1908.

[22] MANSON, SIR P. "Manual of Tropical Diseases," p. 114, 1909.

[23] *Idem.*

[24] ROGERS, L. "Fevers in the Tropics," 1908.

[25] Cited by MARCHIAFAVA and BIGNAMI. "Malarial Fever," p. 406; *Twentieth Century Practice of Medicine*, vol. xix, 1901.

[26] *Idem.*

[27] Cited by MANSON. "Manual of Tropical Diseases," revised, pp. 78-148, 1903.

[28] MARCHIAFAVA and BIGNAMI. "Malarial Fever," p. 406; *Twentieth Century Practice of Medicine*, vol. xix, 1901.

[29] OSLER, SIR WM. "Principles and Practice of Medicine," fifth edition, 1903.

[30] VAUGHAN, VICTOR C. *Loc. cit.*

[31] CURSCHMAN and OSLER. "Nothnagel's Encyclopædia of Medicine"; "Typhoid and Typhus Fevers," 1902.

[32] MCCRAE, THOMAS. "Osler's System of Modern Medicine," vol. ii, pp. 173-174, 1907.

[33] Cited by WARREN COLEMAN. "Short Duration Typhoid Fever," *The American Journal of Medical Sciences*, vol. cxxxvii, No. 6, pp. 781-788, June, 1909.

[34] ROGERS, L. "Fevers in the Tropics," pp. 109-147, 1908.

[35] "Atypical Typhoid Fever: Results with Blood Cultures," *The Journal A.M.A.*, vol. lii, No. 14, pp. 1093-1096, April 3, 1909.

[36] DEEKS, W. E. "Typhoid and Allied Fevers in Panama, *Proceedings of the Canal Zone Medical Association*, pp. 41-51, April, 1909—March, 1910.

[37] COLEMAN, WARREN. "Short Duration Typhoid Fever," *The American Journal of the Medical Sciences*, vol. cxxxvii, No. 6, pp. 781-789, June, 1909.

[38] MARCHIAFAVA and BIGNAMI. *Loc. cit.*

[39] *Idem.*

"Bulletin of the Johns Hopkins Hospital," vol. 24, No. 266 April, 1913.

Dengue.—Stitt, writing on this subject, lays stress on the early leucopenia occurring in the disease, and also mentions a slowing of the pulse. This latter symptom would not seem to be a universal one, however, as other observers have not noticed it in other parts of the world. The author believes the infection is mosquito borne, and mentions the work of different observers in support of this.

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THE JOURNAL OF

Tropical Medicine and Hygiene

MAY 15, 1913.

AN HISTORICAL MEDICAL MUSEUM.

FOR a considerable time we have been looking forward with interest to the Historical Medical Museum which Mr. Henry S. Wellcome has been organizing and preparing. Assuredly the Museum will form one of the most interesting features of the International Medical Congress of 1913. Nothing so elaborate of the kind has ever been put together and the wealth of treasures of historic interest presented will prove a revelation. Commencing with the most ancient times represented by statutes of healing gods from Egypt, China, Greece, Rome, Mexico, and the less-civilized countries, we are made acquainted with such pharmaceutical appliances as pharmacy vases, mortars, scales, weights, drugs, orthopædic appliances, surgical tables, accouchement chairs, and many alchemical apparatus used in early times. The result of a study of these and other modes, methods and appliances used by the ancients will bring home to us that modern medicine owes much to the past, and that the science and art of medicine is but a product of the experience of many thousands of debt of gratitude for the great educational treat that he has organized.

The thought that will arise in everyone's mind on visiting the Museum will be: Are the precious items of this unique collection to be dispersed as years. There is scarcely a surgical instrument known to us that had not its prototype in ancient times, certainly in principle, and for the most part in actual detail. The more we look into this phase of the Wellcome Collection the more are we compelled to avow with Solomon that there is nothing new under the sun. The evolution of our modern surgical instruments, as set forth in the Museum, where they are arranged in historical sequence, will afford not only surprise, but must prove, in addition, highly instructive to every medical man who even cursorily examines the collection.

Tropical medicine is well represented in its historical aspects. Such subjects as plague, malaria, yellow fever, sleeping sickness, ankylostomiasis, filariasis, bilharziasis, Oriental sore, kala azar, pellagra, &c., are illustrated by maps, portraits, prints, medals, books, and pamphlets. Of special interest are the exhibits relating to the history of dracunculus, filaria, and to the etiology and prophylaxis of plague in ancient times. In the Museum there will be found also reconstructed barber-surgeons' and apothecaries' shops, alchemists' laboratories, and even a taberna medica or surgery of the Roman period in Pompeii. Relics of famous inventors and discoverers in the realm of medicine and the allied sciences form another attractive feature of the exhibition. Amongst these we have personal relics of Dr. Edward Jenner, including the original lancets and scarifiers he employed; his case and account books, and several of his personal and domestic surroundings. The discovery of anæsthesia by Henry Hill Hickman and Sir James Y. Simpson is presented to us by several interesting relics and appliances. The advent of the knowledge of galvanism and the original apparatus used by the famous Galvani in making his first experiments undoubtedly prove not the least fascinating section of this wonderful Museum.

Wonderful it all truly is, not only as regards the objects themselves, but we stand astonished at the amount of labour, forethought, historical acumen and zeal bestowed upon the organization and development of so vast a collection.

The drawings by Terzi, Cooper, Schwarz, and Monro-Orr are at once artistic and instructive, and especially is this the case in the department of tropical medicine and tropical parasitology. It is neither the time nor place to give a categorical description of the various items in the several sections of the Museum; that we hope to accomplish later. Suffice it to say, that the Historical Medical Museum will become itself historical, for it is a veritable revelation. To Mr. Henry S. Wellcome scientific medicine, and especially tropical medicine, is already deeply indebted, but the medical profession of every country will owe him a permanent soon as the Congress is over? The fervent hope will be that in some way this calamity may be prevented. The question arises: How is this to be accomplished? Mr. Wellcome has possibly already considered the future place and purpose of the Museum; if so we are content, for we know that whatever is done will be done judiciously and loyally. The monetary value of the collection and the expenses of bringing it to its present state of perfection must have been enormous, and the intrinsic value of many of the treasures it contains cannot be represented in pounds, shillings, and pence. Whatever may happen, it is to be hoped that the acknowledged usefulness of the Museum to science will be so great that an attempt should

be made to secure its permanency as a national asset.

In the department of tropical medicine we are greatly beholden to Mr. Wellcome. First and foremost amongst the many benefits he has bestowed are the Wellcome Laboratories, in Khartoum, where Dr. Andrew Balfour has worked for many years and has advanced our knowledge in many directions. Without Mr. Wellcome's timely assistance the subject of pellagra would have been neglected; and the London School of Tropical Medicine is deeply beholden to the same generous donor. Yet another immense help has been afforded by the prominent position given to tropical medicine in the great Historical Medical Museum he has established.

J. C.

Annotations.

Maize and Pellagra.—Reed, in a recent paper published in the *New York Medical Journal*, xci, 164, 1910, called attention to the presence of the fungus *Diplodia zeæ* upon maize and to the possibility that this fungus may play a *rôle* in the etiology of pellagra. Data were presented showing that following the growth of the fungus a toxic substance was generated in the maize which was believed to be similar to or identical with the "pellagrozein" of Lombroso. The investigation of protein constituents of mouldy maize is still under way, but in the meantime some data have been secured upon the relation of phosphorus compounds of maize.

The idea that spoiled or mouldy maize may contain larger amounts of inorganic constituents would seem to be a logical assumption, since it is well known that the active respiration of the moulds and bacteria oxidizes large amounts of the carbon compounds. Black and Alsberg find, however, that a badly spoiled maize is not always characterised by a high ash content, although in Italy a high ash content is regarded as significant.

The object of Reed's present contribution (*New York Medical Journal*, March 22, 1913) is to bring together some data on the presence and possible significance of inorganic phosphates in maize inoculated with pure cultures of mould fungi, along with some samples of moulded commercial corn.

From the data collected he concludes that it would appear that *Diplodia zeæ* and other fungi grown upon corn meal liberate material amounts of inorganic forms.

Corn meal infected with diplodia loses in weight, the loss increasing with the age of the culture.

Aside from the question of the possible toxicity of any of the inorganic phosphates thus liberated or their possible *rôle* in the etiology of pellagra, the data show what is interpreted as a marked deterioration in the food value of the maize, due to the degradation of organic phosphorus and other compounds. As the fungi continue to grow they may take up a portion of the inorganic phosphates, possibly to form bodies having toxic properties.

The Health of the Canal Zone for 1912.—Gorgas, in his Report of the Department of Sanitation of the Isthmian Canal Commission for the year 1912, states that the death-rate among employees of the Isthmian Canal Commission and Panama Railroad Co. for 1912, compared with similar figures for previous years since 1904, is as follows:—

	Number of employees	Deaths	Rate
1904 ...	6,213 ...	82 ...	13.26
1905 ...	16,512 ...	427 ...	25.86
1906 ...	26,547 ...	1,105 ...	41.73
1907 ...	39,238 ...	1,131 ...	28.74
1908 ...	43,891 ...	571 ...	13.01
1909 ...	47,167 ...	502 ...	10.64
1910 ...	50,802 ...	558 ...	10.98
1911 ...	48,876 ...	539 ...	11.02
1912 ...	50,893 ...	467 ...	9.18

The death-rate among the white employees from the United States from disease was 3.25 per thousand, while the total death-rate for the year for this class of employees was 5.52, as against 5.14 per thousand in 1911. If American women and children are included it will raise the death-rate of Americans from disease to 4.22. Including in the above figures the officers and men of the United States Army and Marine Corps stationed on the Canal Zone and their families, the death-rate from disease is lowered to 3.86 per thousand. The death-rate from disease in the Army for the year 1911 was 2.66 per thousand.

Taking special diseases, the deaths among employees have been as follows:—

	1905	1906	1907	1908	1909	1910	1911	1912
Typhoid fever	12	42	98	19	13	13	10	4
Dysentery ...	14	69	48	16	8	21	13	7
Pneumonia ...	95	413	328	93	70	73	94	57
Malaria ...	86	233	154	73	52	50	47	20

The improved conditions as regards deaths from malaria among employees continue, and the same is true of the admission rate to hospitals, as is shown by the following:—

Per thousand: 1904, 125; 1905, 514; 1906, 821; 1907, 424; 1908, 282; 1909, 215; 1910, 187; 1911, 184; 1912, 110.

Deaths among employees from the other principal diseases were as follows: Abscess of liver, 4; nephritis, acute and chronic, 36; from all forms of tuberculosis, 70; leaving 126 deaths among employees from all other diseases, and 143 deaths from external violence.

Considering the death-rate of the total population, including the cities of Panama and Colon and the Canal Zone, the rates for the different years are as follows:—

Per thousand: 1905, 49.94; 1906, 48.37; 1907, 33.63; 1908, 24.83; 1909, 18.19; 1910, 21.18; 1911, 21.46; 1912, 20.49.

One case of yellow fever, on a ship from Guayaquil, Ecuador, was isolated in Santo Tomas Hospital, and died there on July 14.

With this exception, no cases of yellow fever, plague, or small-pox occurred on the Isthmus during the year.

The Health of the Canal Zone for the month of February, 1913.—Gorgas reports that the total number of deaths from all causes among employees was 42, divided as follows: Disease 27 and violence 15, giving the annual average per thousand of 5.86 and 3.25, respectively.

Among employees for the month of February of each year the annual average death-rate per thousand was as follows:—

1905, 14.05; 1906, 29.09; 1907, 30.74; 1908, 12.80; 1909, 9.42; 1910, 8.75; 1911, 9.88; 1912, 10.57; 1913, 9.11.

The annual average death-rate per thousand in the cities of Panama and Colon and the Canal Zone, including both employees and civil population, for the month of February of each year was as follows:—

1905, 42.07; 1906, 43.96; 1907, 36.07; 1908, 21.40; 1909, 18.59; 1910, 17.50; 1911, 18.60; 1912, 16.33; 1913, 21.10.

In segregating according to race, the annual average death-rate per thousand from disease among employees was: For whites 6.52 and for blacks 5.65, giving a general average for disease of 5.86. For the same month during 1911 the annual average death-rate per thousand from disease among whites was 5.67 and blacks 6.47, giving a general average of 6.27; and in 1912 from disease among whites 4.61 and blacks 7.34, giving a general average of 6.66.

Among employees during the month, deaths from the principal diseases were as follows: Abscess of liver, entamœbic, 1; hæmoglobinuric fever, 1; pneumonia, 4; malaria, 1; tuberculosis, 5; leaving 15 deaths from all other diseases and 15 deaths from external violence.

On December 15, 1912, all the sick camps were closed, with the exception of those located at Culebra, Toro Point, and Porto Bello.

No cases of yellow fever, small-pox, or plague originated on or were brought to the Isthmus during the month.

Sporotrichosis.—Taylor, writing in the *Journal of the American Medical Association* (vol. lx, No. 15), April 12, 1913, contributes a paper on "Sporotrichum Schenckii." He reports the results of his work on the morphology and cultural characteristics of the organism, and describes also the lesions produced by it. He found, for example, that:—

(1) The spores of the organism were attached to the mycelia by short pedicles.

(2) That so-called chlamydospores were of frequent occurrence.

(3) That spores, similar in form to those grown on blood-serum, could usually be demonstrated in paraffin sections of the tissue lesions, and shown in most cases in direct preparations from the abscesses.

(4) That in one case it appeared that mycelial growth took place in the necrotic tissue at the centre of a large abscess caused by the organism.

(5) That methyl thionin proved best for staining the organism grown on artificial mediums, and a modification of Gram's stain was most satisfactory for its demonstration in the tissues.

(6) That the organism failed to liquefy gelatin after six weeks' growth at room temperature.

(7) That milk was coagulated after two weeks' growth at room temperature.

(8) That some hint of the possibility of producing an immunity in animals by previous injection of small doses of pure culture may perhaps be based on these observations, but that for the present the work carried out is insufficient to make any definite statement about this.

On the Discovery by Dr. A. R. Neligan of Leishmania in Cutaneous Lesions of Dogs in Tehran, Persia.—Dr. A. R. Neligan, who has been working with Oriental Sore in Tehran, Persia, informs me [Dr. C. M. Wenyon] by letter that he has discovered leishmania in great abundance in ulcers on dogs' faces. In no case has he found the parasites in the liver or spleen, so that it seems highly probable that Dr. Neligan is dealing with Oriental Sore in dogs, for the disease in man is very common in Tehran. It has long been held popularly that dogs suffer from this disease, but this is the first instance of the definite discovery of *Leishmania tropica* (for the parasite is probably such) in the skin lesions of these animals, and is of the utmost interest in that it places Oriental Sore on the same footing as infantile kala azar, which is known to affect dogs as well as children fairly commonly in the Mediterranean districts. It may be of interest to note that in the Transcaucasus, Dschunkowsky and Luhs (1909) discovered leishmania in a dog which was covered with ulcers. In this case, however, the authors make no mention of the occurrence of leishmania in the skin lesions, for they found the parasites only in the internal organs and in mononuclear cells of the blood.

Sleeping Sickness in Nyasaland.—Hearsey continues his diary on this subject (Part XIX). He states that during the past quarter fifteen additional cases of sleeping sickness have been reported; of this number twelve cases were found by Dr. Shircore and two by Dr. Conran, in the sleeping sickness area; the remaining case was notified by Dr. Morgan from the Marimba district. These added to the cases previously reported now make a total of 108.

The author also made an inspection of the sleeping sickness area. He found that tsetse flies were frequently to be seen in and around many of the villages; and it was accordingly recommended, in order to prevent the spread of infection in village communities, that clearings should be made around all the villages in the proclaimed area. This has been done, and Dr. Shircore has reported that these clearings have been attended with marked success in banishing the flies.

These investigations came to a termination on November 30. During the eight months over which

they extended only one case of trypanosome infection was discovered, the patient being a native of the adjoining Marimba district. It should, however, be remembered that some ten cases of trypanosomiasis have up to the present been discovered in, or found to have emanated from, the districts lying to the north and south of the proclaimed area; and it is therefore reasonable to assume that the factors necessary for acquiring infection are not limited to the Dowa sub-district. Much difficulty has been experienced by medical officers owing to the natives refusing to present themselves for examination and hiding their sick. This difficulty has, however, been largely overcome in the proclaimed area of the Dowa sub-district by the employment of special police.

Chronic or Resolving Plague in Rats.—In the Seventh Report on Plague Investigations in India there is a very interesting account of chronic or resolving plague in rats.

The Commissioners have already dealt with this subject in previous numbers of these reports (vol. vi, p. 580; vol. vii, pp. 457, 719; vol. x, p. 335). In order, however, to obtain a more complete knowledge of the condition, it was decided to make a careful examination daily of some two hundred rats (100 *Mus decumanus* and 100 *M. rattus*) caught alive in Bombay city. It is proposed to carry on this examination for a whole year. At the same time the Commissioners continued to gain experience of the condition in other places in India, for example at Poona, and they were thus able to compare the frequency and character of the lesions found in rats in these plague-infected centres with similar lesions found in rats in the plague-free city of Madras.

The conclusions which were ultimately reached are as follows:—

(1) Lesions, for which the terms resolving and resolved plague lesions are proposed, are found in rats which have been subjected to plague infection and in certain individuals are stages in the natural process of recovery from the acute form of the disease.

(2) These lesions are very different from the lesions found in the acute stages of the disease. They are generally localized and confined for the most part to the spleen.

(3) It is not always possible to prove that these lesions are due to the plague bacillus by isolating that bacillus from them, for in many cases the bacilli have been killed, have disappeared, or been replaced by some other organism.

(4) That the lesions are frequently produced by the plague bacillus has been shown by (*a*) demonstrating the presence of plague bacilli in some of these lesions which exactly resemble others, either in the same rat or in other rats, in which no plague bacilli can be found; (*b*) by showing that the lesions increase in numbers during and after epizootics of the disease.

(5) Nevertheless the fact must be borne in mind that very similar lesions can be produced by other causes, as has been shown by an experience of the examination of rats in Madras city, where plague is not present.

The Etiology of Beriberi.—Vedder and Clark, in continuation of their studies on beriberi, contribute a paper to the *Philippine Journal of Science* (the *Philippine Journal of Tropical Medicine*), vol. vii, October, 1912, No. 5, entitled "A Study of Polyneuritis Gallinarum; a Fifth Contribution to the Etiology of Beriberi." The paper is divided up as follows:—

(1) Observations on symptomatology; (2) observations on pathology; (3) observations on the earliest degenerative changes in the nerves; (4) the influence of various articles of food on the production of polyneuritis gallinarum; (5) summary; and (6) conclusions and discussion.

As regards degeneration in the peripheral nerves, in polyneuritis gallinarum, such changes as shown by the Marchi method were observed in all the cases examined. Unlike the sciatic nerve, however, the extent and degree of degeneration in the vagus did not always correspond to the severity of the symptoms before death, nor was the most extensive degeneration to be seen in the vagus nerve of those cases which showed prostration. Fowls in good general condition sometimes showed extensive degeneration in the vagus. Likewise, the authors were not able to establish an interrelation between the severity of the degeneration in the vagus and the amount of pathologic change in the heart.

The authors' summary of their work is as follows:—

(1) There appear to be three types of polyneuritis gallinarum:—

(*a*) A form in which the symptoms of neuritis and those of general prostration are combined. This is the usual form. When these birds are given an extract of rice polishings they improve at once in general condition, but the symptoms of neuritis only disappear after several months of treatment.

(*b*) A form in which there is pronounced neuritis, but the fowl remains in good general health. These fowls will also recover from the neuritis after several months' treatment with the extract of rice polishings.

(*c*) A form described above as fulminating cases, in which the symptoms of neuritis are absent, but in which greater general prostration occurs. These fowls recover speedily when given extract of rice polishings.

(2) In polyneuritis gallinarum developing after a prolonged diet of polished rice the heart may show no microscopic change. In other cases the heart may show slight œdema, a slight increase in pigment, or an appearance of beginning mucoid or parenchymatous degeneration.

(3) While in marked cases of neuritis every fibre of the vagus may and usually does show degenerative changes, as indicated by the Marchi

method, no fibre has been observed in which the change was far advanced. The authors have not been able to correlate the extent of degeneration in the vagus with the change in the heart nor with the severity of the symptoms before death.

(4) No marked changes suggestive of degeneration have been observed in the cervical sympathetic ganglia nor in the post- or pre-ganglionic fibres.

(5) In every one of the fifty-six fowls which had been fed thirty-five days or more on polished rice, changes indicative of degeneration (Marchi method) were seen in the fibres of the sciatic nerve, regardless of whether symptoms of neuritis had or had not manifested themselves before death.

(6) Advanced degeneration in the peripheral nerve fibres manifests itself by a change in both myelin sheath and in the axis cylinder. The myelin sheath breaks up into globules and droplets, which stain black in the Marchi solution—indicative of fatty degeneration. The axis cylinder breaks up into segments or disintegrates in all those fibres showing advanced degeneration in the medullary sheath.

(7) The degree of degeneration in the sciatic nerve corresponds closely with the extent of the paralysis of the legs. Advanced degeneration was observed in only 10 to 15 per cent. of the fibres of the sciatic nerve of fowls showing pronounced symptoms of leg paralysis. In the remaining fibres the change was not advanced.

(8) The authors could detect no difference in the degeneration in the sciatic and its peripheral branches either as regards extent or time of onset.

(9) Degeneration was observed in both dorsal and ventral nerve-roots, being most pronounced in the latter.

(10) Degenerative changes in both axis cylinder and medullary sheath were seen in fibres of all columns of the thoracic spinal cord.

(11) Changes were observed (Nissl method) in certain large cells of both ventral and dorsal horns of the grey substance of the lumbosacral cord. In the cells of both horns, the tigroid bodies were not visible, and the stainable material was collected at one side of the cell around the base of one of the processes. Cells were occasionally seen whose nuclei stained very poorly.

(12) Mitochondria were observed in the nerve-cells of the lumbosacral cord, even though there was a pronounced alteration of the tigroid bodies. The mitochondria here were of similar appearance and almost or quite as numerous as in corresponding cells of the normal cord.

(13) In the medullary sheath of fibres of the sciatic nerve of normal fowls numerous small, bacilli-like rods, arranged radially around the axis cylinder, were made apparent by the various mitochondria methods. These structures are probably mitochondria.

(14) Fowls show alteration in the medullary sheath of the sciatic fibres after only seven days on a polished rice diet. In the sciatic fibres of fowls fed for seven days on polished rice alone, the rods are scarcely to be observed. Instead, the stainable material shows remarkable alterations and occurs in the form of irregular, branched, and anastomosing masses.

(15) In fowls fed for a longer period these masses show, in a certain percentage of the fibres, progressive changes which manifest themselves in the form of more definite skeins and segmentations and larger masses and globules of stainable material. In fibres showing marked degeneration by the Marchi method these occur as larger or smaller vesicular, oval globules and correspond to the black globules shown by the Marchi preparations.

(16) When fowls are fed on polished rice and in addition given some protective substance, such as is contained in extract of rice polishings or in various foods, but in insufficient quantity to confer complete protection, the disease appears in its characteristic form and with all the evidences of nerve degeneration, but after a prolonged incubation period—forty-five to ninety days, or even after one year of such feeding (Eijkman).

(17) When fowls are fed on polished rice and in addition receive daily 10 grm. of white wheat bread or 5 c.c. of canned milk, they receive little or no protection from polyneuritis gallinarum.

(18) When fowls are fed on polished rice and in addition receive daily 10 grm. of meat cooked or uncooked, 10 grm. of potatoes cooked or uncooked, or 5 c.c. of fresh cow's milk, they receive partial protection as indicated by the prolongation of the incubation period.

(19) When fowls are fed on polished rice and in addition receive daily 10 grm. of dried peas or 10 grm. of peanuts, they receive complete protection for at least sixty days.

Reviews.

SURGERY OF THE LUNG. By C. Garrè and H. Quincke. Second Edition, with 114 coloured and other illustrations, and two coloured plates. Translated from the German by David M. Bancroft, M.D. London: John Bale, Sons, and Danielsson, Ltd., Oxford House, 83-91, Great Titchfield Street, Oxford Street, W.

The second edition of this useful work is now to hand. Since the publication of the first edition surgery of the lung has made considerable progress. As the authors say, not only by constant and careful elaboration of the old methods of procedure have the operations then in vogue been more frequently and, on the whole, more successfully carried out, but new methods have been invented and new indications laid down. The most important advance is the method of maintaining difference of pressure, which has enlarged the sphere of surgical operation to an extent hitherto unimagined.

Amongst other new operations worthy of note are those of artificial pneumothorax and thoracoplasty and the surgical mobilization of the thorax by the bisection of the costal cartilage. Owing to the increase of material the first edition has had to be considerably altered, and in many parts

re-written. The result, the second edition, is thoroughly up to date, and should prove very valuable.

THE REDUCTION OF DOMESTIC FLIES. By Edward Halford Ross, M.R.C.S., L.R.C.P., of the John Howard McFadden Researches, the Lister Institute of Preventive Medicine, London. With illustrations. London: John Murray, Albemarle Street, W.

A very useful and instructive work on a problem of the very greatest importance to public health, especially as regards the prevention of the spread of disease. The author in his introduction states that in some countries anti-fly campaigns are in progress, but that in Great Britain little has, so far, been done generally to attack the problems. A few individual efforts have been made, but these have been few and far between.

It is to be hoped that the production of the author's work will rectify these omissions and help to start a campaign which all far-seeing men, whether medical, scientific, or of the laity, should support by all means in their power.

Notes and News.

MESSRS. BAILLIERE, TINDALL AND COX announce that the new edition of Castellani and Chalmers' "Tropical Medicine" will be published almost immediately. This text-book, written from the authors' wide experience in the Tropics, contains all the most recent researches. The new edition has been brought fully up to date (March, 1913). All the more important parts were kept in the authors' hands until the last moment, so that no fresh discovery should be omitted. The book has been revised throughout, and many of the chapters, notably the ones on protozoa, fungi, skin affections, pellagra, enteric fever and trypanosomiasis, have received special attention. Some 250 new illustrations have been introduced, and the text has been increased by the addition of some 500 pages; the price, however, remains the same.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"United States Public Health Reports," vol. xxviii, No. 6, February 7, 1913.

Ankylostomiasis in Southern China.—Brown reports that in addition to ankylostomiasis, *Ascaris lumbricoides*, *Trichocephalus dispar*, *Clonorchis sinensis*, *Strongyloides intestinalis*, *Fasciolopsis buski*, and *Oxyuris vermicularis* infections occur. Brown treats his cases of ankylostomiasis either by the eucalyptus chloroform mixture or by thymol.

"Journal of the Royal Army Medical Corps," vol. xx, No. 4, April, 1913.

Malaria.—Lieutenant-Colonel Beach and Captain Leeson report an interesting outbreak of malaria in a company of the 2nd Devon Regiment. The company was sent from Alexandria to Cyprus on May 30, 1912. On arrival it was posted to Nicosia, where it remained one month, subsequently proceeding to Troodos (Hill Station) for three months. At the end of this time it was not considered necessary to keep the company in Cyprus any longer, and it was ordered back to Egypt. As the place of bivouac on the march down from Troodos to Limasol was reported to be malarious, prophylactic doses of quinine were given to all the men before leaving Troodos, 10 gr. on September 27 and 29. The march was about 35 miles, and they bivouacked for the night of October 1 at a place called Zeegoe. This place was apparently infested with mosquitoes, as most of the men complained that they were severely bitten that night. The next day they reached Limasol and embarked for Alexandria. During their stay in Cyprus the health of the men was excellent: one man only, Private A., contracted malaria while the company was at Troodos. For eleven days after arrival in Alexandria the health of the company was good, but from October 13 cases of fever began to occur and a number of men were sent to hospital with symptoms suggestive of malaria.

The admissions were as follows:—

October	13,	1912	...	...	1
,,	14	,,	...	...	7
,,	15	,,	...	...	1
,,	16	,,	...	...	1
,,	17	,,	...	..	6
,,	29	,,	...	..	1
					17

When all the circumstances of the case are taken into consideration, viz., the limitation of the cases to this company, their freedom from malaria in Troodos, their having been bitten at Zeegoe, and their immediate return to Egypt, there is no doubt that the disease was contracted on the evening and night of October 1, and this is interesting as showing very definitely the period of incubation.

"The Journal of the American Medical Association," vol. lx, No. 15, April 12, 1913.

Sporotrichosis.—Walker, writing on this subject in the above number of the *Journal of the American Medical Association*, gives the following useful bibliography of the subject:—

(1) Widal and Abrami. *Ann. de l'Inst. Pasteur*, 1910, No. 24, 1.
(2) Gougerot, H. "Folia Clinica et Microscopica," 1908-9, i, 263.
(3) De Beurmann and Gougerot. "Les Sporotrichoses," Paris, 1912.
(4) Page, Frothingham and Paige. *Journ. Med. Research*, 1910, No. 18.
(5) Greco. *Argentina Med.*, 1907.
(6) Walker and Ritchie. *Brit. Med. Journ.*, 1911, No. 2635, p. 1.
(7) Lutz and Splendore. *Ann. d'ig. sper.*, 1907, xvii., 581.
(8) Kren and Schramek. *Wien. klin. Woch.*, 1909, p. 1519.
(9) Schenck, B. R. *Bull. Johns Hopkins Hosp.*, 1898, ix, 286.
(10) De Beurmann and Gougerot. *Arch. f. Derm. u. Syph.*, 1911, cx, 25.
(11) Hektoen and Perkins. *Journ. Exper. Med.*, 1900, v, 77.
(12) Garin, Charles. *Provence med.*, 1911, No. 18, p. 194.
(13) Ripal and Dalous. *Ann. de derm. et de syph.*, 1910, li, 872.

(14) Arndt, G. *Derm. Zeitschr.*, 1910, xvii, 24, 171.
(15) Armstrong, John M. *St. Paul Med. Journ.*, xiv, No. 4.
(16) Taylor, K. *Journ. Amer. Med. Assoc.*, August 10, 1912, p. 441.
(17) Bonnet, L. M. *Rev. de méd.*, 1911, p. 99.
(18) Pinoy and Magrou. *Compt. rend. Soc. de Biol.*, 1911, lxxi, 387.

In addition to these, which are cited in his paper in the order given, he also gives the following:—

LABORATORY WORK.

Adamson, H. G.. *Brit. Journ. Derm.*, 1908, No. 20, p. 296.
De Beurmann and Gougerot. *Ann. de derm. et de syph.*, 1906, pp. 837, 914, 993; *Bull. Soc. méd. des Hôp.*, 1907, pp. 268, 302, 308, 380, 585, 1055, 1060; 1908, Nos. 24 and 25; *Compt. rend Soc. de Biol.*, 1909; "Les Nouvelles Mycoses," Paris, 1911.
Dor. *Presse méd.*, April 14, 1906, p. 284.
Pearsom, L. *Penn. Livestock Bull.*, 1907, No. 8.
Pinoy, E. *Compt. rend. Acad. Sc.*, 1911, clii, 286.
Rothe, L. *Deutsch. med. Woch.*, 1910, No. 1.
Reudiger, G. F. *Journ. Minnesota State Med. Assoc.*, November, 1911.
Stelwagon. "Diseases of the Skin," Ed. 6, p. 1119.
Tokishiga, H. *Centralbl. f. Bakteriol.*, 1 Abt., 1896, xix, 105.
Troisler and Berthelot. *Compt. rend. Soc. de Biol.*, 1911, lxxi, 264.

CLINICAL WORK.

Archard et Ramond. *Bull. Soc. méd. des Hôp.*, 1909, p. 738.
Arndt, G. *Berl. klin. Woch.*, 1909, No. 44.
Balzer et Vandet-Neveux. *Bull. Soc. franç. de derm. et de syph.*, July, 1910, No. 7.
Balzer et Marie. *Ibid.*, March 1910.
Beam, Albert. *Journ. Amer. Med. Assoc.*, June 10, 1911, p. 1719.
Block, Bruno. *Beihefte zur med. Klin.*, 1909, v, Nos. 8 and 9.
Bonnet. *Lyon méd.*, 1911, No. 3, p. 115; *Bull. Soc. franç. de derm. et. de syph.*, December, 1910.
Burlew, J. M. *South California Pract.*, 1909, xxiv, 1.
Capart. *Centralbl. f. Path. u. Bact.*, 1911, No. 2, p. 85.
Costa, S. *Compt. rend. Soc. de Biol.*, 1911, lxx, No. 24, pp. 35-37.
Danlos et Flaudin. *Bull. Soc. franç. de derm. et de syph.*, No. 7, July, 1909.
De Beurmann and Gougerot. *Rev. de méd. et d'hyg. trop.*, T. 7., 1910, No. 3, p. 185; *Bull. Soc. méd. des Hôp.*, 1909, S. 739; 1909, No. 17.
De Beurmann, Gougerot et Laroche. *Bull. Soc. méd. des Hôp.*, 1909, No. 15.
Gross, G., et Heully, L. *Rev. méd. de l'Est*, 1911, p. 65.
Harker, H. J. *Journ. Amer. Med. Assoc.*, May 6, 1911, p. 1312.
Hodara, Menahem et Fuad Bey. *Arch. f. Derm. u. Syph.*, cx, 1911, H. 3, p. 387.
Hügel, G. *Arch. f. Derm u. Syph.*, 1910, cii, 95.
Jeanselme, J., et Chevalier, P. *Bull. Soc. franç. de derm. et de syph.*, p. 190.
Jocas, R. *La Clin. Ophth.*, 1911, p. 62.
Josset-Moure. *Bull. Soc. méd. des Hôp.*, 1908, No. 37; 1909, No. 11.
Legry, Sourdel et Velter. *Bull. et mém. Soc. méd. des Hôp.*, Paris, 1911, No. 25.
Letulle, M., et Débré. *Bull. Soc. méd.*, 1908, p. 379.
Ofenheim, V. *Lancet*, London, 1911, i, 10.
Pantrier et Lutembacher. *Bull. Soc. franç. de derm. et de syph.*, No. 7, July, 1909.
Steward, W. B. *Journ. Amer. Med. Assoc.*, August 5, 1911, p. 482.
Sutton, J. M. *Journ. Amer. Med. Assoc.*, May 6, 1911, p. 1309.
Sutton, L. R. *Boston Med. and Surg. Journ.*, 1911, No. 6, p. 179.
Thibierge, G., et Weissenbach, R, J. *Bull. Soc. franç. de derm. et de syph.*, 1910, xxi, 186.
Thibierge et Gastinet. *Bull. Soc. méd. des Hôp.*, 1909, No. 11.
Trimble, W. K. *Journ. Kansas Med. Soc.*, 1909, ix, p. 305.
Widal, F., et Weill, A. *Bull. Soc. méd. des Hôp.*, 1908, No. 22.

As the author points out, any one watching research work in the last two years must have been struck by the growing interest in sporotrichosis. The organism was only recovered by Schenck in 1898 in human lesions, but since that time a very large amount of work, as the above bibliography shows, has been done on the subject.

"The Journal of the American Medical Association," vol. lx, No. 16, April 19, 1913.

Budding in Entamœba tetragena.—Darling, after having studied kittens experimentally infected with *E. tetragena*, believes that he has established a correlation between the findings of Schaudinn and Craig on the one hand, and those of Viereck, Werner and Hartmann on the other. He agrees with the latter observer that *E. tetragena* is the common pathogenic entamœba of man, and that the so-called *E. histolytica* is in all likelihood a spurious species, the alleged spore-cyst development having been described from degeneration forms in senile races of *E. tetragena*.

"The Journal of the American Medical Association," vol. lx, No. 16, April 19, 1913.

Emetine in the Treatment of Amœbic Dysentery.—Lyons, writing on the treatment of amœbic dysentery by emetine, summarizes the advantages of this method as follows: (1) Simplicity and ease of administration of the drug; (2) no vomiting or depression; (3) accurate dosage (no loss through bowels); (4) rapid absorption and effect; (5) reliability of product (hydro-chlorid). In answer to the question—Does it cure? he gives the subsequent histories of five patients who recovered. Four have been heard from or seen and all have remained well. Patient 1 is still cured after three months and three weeks; Patient 3 after two months; Patient 4 after three months; Patient 6 after two months and three weeks. Patient 5 has unfortunately been lost sight of. While these intervals of good health are not long, the outlook is, however, very encouraging. While no definite conclusions can be drawn from the observations of so small a number of cases, the author believes that the results are highly suggestive that in the subcutaneous injections of soluble emetine salts an ideal method has been found of treating amœbic disease. The application of Vedder's experimental work to clinical cases has certainly been a most happy one, and as far as it has gone a most successful one.

Notices to Correspondents.

1.—**Manuscripts sent in cannot be returned.**

2.—**As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.**

3.—**To ensure accuracy in printing it is specially requested that all communications should be written clearly.**

4.—**Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.**

5.—**Correspondents should look for replies under the heading "Answers to Correspondents."**

Original Communications.

CELL INCLUSIONS IN THE LEUCOCYTES OF BLACKWATER FEVER AND OTHER TROPICAL DISEASES.

By GEORGE C. LOW, M.A., M.D., C.M.
AND
C. M. WENYON, M.B., B.S., B.Sc.
London School of Tropical Medicine.

IN a paper published in THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE, vol. xv, No. 11, June 1, 1912 [2], one of us (G. C. L.) stated that cell inclusions similar to those described by Sir W. Leishman in the blood of blackwater fever cases [1] had been seen in the blood of fever cases from Borneo and also in the blood of pellagra cases from Italy. Since that time we have followed up the subject by examining the blood of many different tropical conditions, viz., malaria (recent and chronic), blackwater fever, trypanosomiasis, sprue, filariasis, anæmias of various kinds, &c., and have specially noted the presence or absence of chromatin inclusions in the cells in such cases. In addition we have made a special study of what are usually called "Large Mononuclear" cells, and have come to the conclusion that these must be differentiated up into different varieties or types. Two at least of these occur. Following the nomenclature proposed by Leishman one may term them (*a*) the endothelial type, and (*b*) the hyaline type.

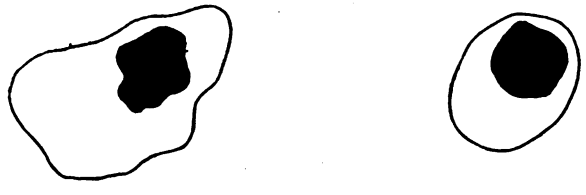


FIG. I.

(*a*) Endothelial type. (*b*) Hyaline type.

In addition to these cells, about which there can be little or no confusion, another type of cell occurs in a certain number of bloods. This is the large lymphocyte—a cell which contains a larger nucleus and a larger amount of protoplasm than the ordinary small lymphocyte. The protoplasm of this large lymphocyte often takes on a blue colour. The differentiation between this cell and the hyaline type "*b*" of the large mononuclears is a much more difficult proceeding, many of the forms running more or less into each other. In bloods where such cells occur it is not fair to classify them either with the ordinary lymphocytes or with the large mononuclears, and the best thing to do is to make a special class for them, terming them large lymphocytes, or dividing the lymphocytes up into large and small.

Apart from having very small red-coloured inclusions, which according to Schilling-Torgau [6] cannot be distinguished from the well-known plasmosomes of Wolf and Ferrata, these lymphocytes do not show the large chromatin inclusions, so need not be considered further. According to the same observer the cells described by Leishman as chrome cells are the basophile granular leucocytes of Ehrlich so often called in this country "mast cells."

In examining malarial bloods, especially chronic cases, one is at once struck with the great variation in number and variety of the large mononuclear cells met with. As recovery takes place and the parasites die out there is of course a tendency for these cells to return to their normal numbers, but even in cases where infection is still undoubtedly

FIG. II.

(*c*) Large lymphocyte. (*d*) Small or ordinary lymphocyte.

present such variations occur. In some bloods the endothelial type of large mononuclear prevails, while in others it is not seen at all. Again, the hyaline type may be the predominant cell present, either alone, or associated with the endothelial in varying numbers. The amount of malaria suffered from does not seem to determine the amount of increase, and probably it is due to some factor or factors of which at present we are ignorant. As examples of this, one may quote the case of a lady who had suffered, by no means severely, from fever on the Gold Coast. Her differential leucocyte count gave 26 per cent. of large mononuclear cells, almost every one of these being of the endothelial type. On the other hand, a young man from Northern Nigeria who had also suffered from slight attacks of malaria, got blackwater fever and died of this, his blood, taken the day before his death, showing no endothelial cells at all after a prolonged search and only 3 per cent. of cells that could in any way be called large mononuclear—these being of the hyaline type. (This case, as well as that of another patient, who said he had never suffered from malaria at all, but whose blood showed both types of large mononuclear cells in large numbers, will be referred to later.)

In addition to malaria and blackwater fever, however, cells of the endothelial type occur in other tropical diseases, such as kala azar and trypanosomiasis, so their presence cannot be taken as diagnostic of any one of these diseases. As regards chromatin inclusions seen in this type of cell, it seems probable that they may have different origins.

The largest inclusions seen in fig. 13 of Leishman's coloured plate appear to be derived from ingested normoblastic nuclei, a view suggested by one of us (C. M. W.) and with which Schilling-Torgau [6] agrees. The medium-sized, or, as we have termed them, large inclusions—by this meaning the compact or ring-shaped chromatin masses, not the dust-like granules or specks—would seem in many cases at least to originate in the nuclei of the cells themselves (*vide* figs. 2 and 4 of coloured plate), but in other instances might result from the ingestion of

parasites containing chromatin (trypanosomes, leishmania, malaria, &c.), or even be the products of disintegration of ingested nuclei, such as the nuclei of lymphocytes or normoblasts (nucleated red cells). (*Vide* fig. 12.)

The cells depicted in the coloured plate have been taken from various sources. The first case (figs. 1 to 6) is of special interest. The patient was sent home from China (Hankow) supposed to be suffering from pernicious anæmia.* Clinically symptoms of sprue, as evidenced by the passage of large, bulky, poorly coloured stools, were present, but the blood count was not typical of that complaint in many respects, other pathological factors evidently playing a part in the production of the anæmia. According to the patient he had never suffered from malaria, and of course had never had blackwater fever.

His complete blood count was as follows:—

Reds	... ...	2,400,000
Whites	... ...	2,000
Hæmoglobin	...	51 per cent. (Von Fleischl's).

Differential Leucocyte Count.

	Number counted	Per-centage
Polymorphonuclear	214 ...	42.8
Large mononuclear { Endothelial type	37 ...	7.4
Large mononuclear { Hyaline type ...	50 ..	10.0
Lymphocytes	131 ...	26.2
Eosinophile	61 ...	12.2
Transitional	3 ...	0.6
Mast cells	3 ...	0.6
Myelocytes...	1 ...	0.2
	500	100.0

Poikilocytosis not very marked; extraordinary irregularity in size of reds, enormous numbers of megalocytes; two normoblasts, and a fair number of megaloblasts seen. No polychromatophilia or basophilic degeneration of reds. No malarial or other parasites, no pigmented leucocytes. Many chromatin inclusions in the large mononuclear cells.

A perusal of the above blood count is distinctly against the diagnosis of pernicious anæmia. There is, however, a very marked leucopenia, and differentially a large relative increase of the large mononuclears and eosinophiles. Both the endothelial and hyaline type of large mononuclears are present, and why this should be is not quite clear, as the patient is quite emphatic in stating that he has never suffered from malaria. He might, of course, have had the disease in a latent form, but against this is the complete absence of malarial parasites in his blood in the prolonged examinations made. In one cell there was what appeared to be black pigment, but as this was not found again in other cells its significance must be regarded as doubtful. Kala azar would also seem to be excluded, because of the normal size of the liver and spleen.

The eosinophilia in turn requires explanation. Having come from Hankow the question of schistosomiasis of course crops up, but no ova of this, or any other parasites, have so far been discovered in the stools, nor have any other signs of helminthic infection been detected.

The blood count certainly is a peculiar one.

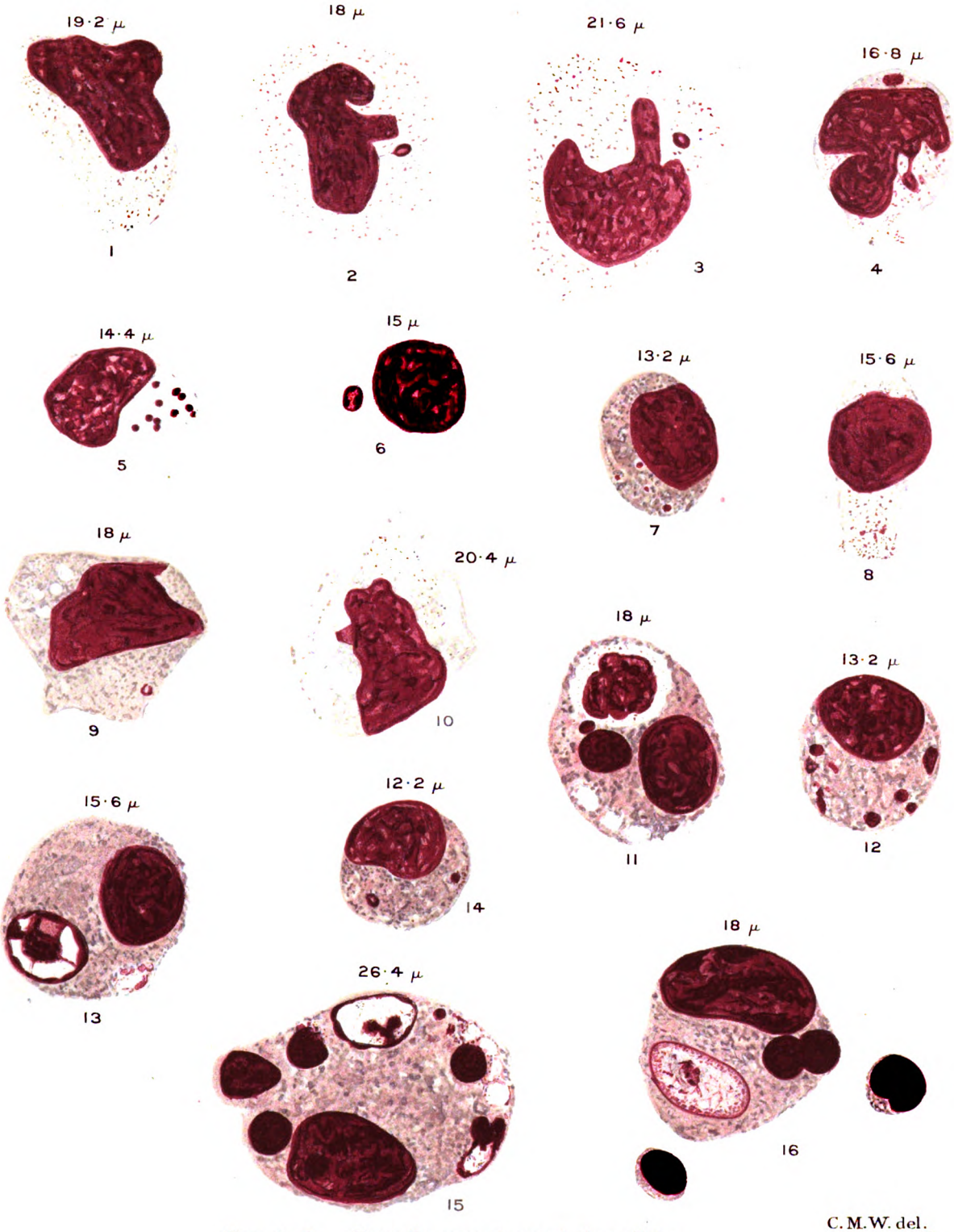
Turning now to the cells from this case shown in the plate, figs. 1 to 4 are typical cells of the endothelial type; three of these possess many fine chromatin granulations which are apparently indistinguishable from those in Leishman's case of blackwater fever. Figs. 2, 3, and 4 have large inclusions and in two of these it is clearly evident that they are taking origin from the cell nucleus. These two cells, it may be stated, are not isolated instances of this mode of origin as they are fairly frequent in the single film from which the ones referred to were taken. Figs. 2 and 3 show the ring form very clearly. Fig. 5 is a typical hyaline, large mononuclear cell, and illustrates those chromatin inclusions which have been described as plasmosomes. There remains fig. 6, which is a cell intermediate in some ways between the endothelial and hyaline types; it contains a typical chromatin ring.

The second case (figs. 7 to 10) are cells of the peripheral blood of a case of Rhodesian trypanosomiasis (Case G) taken when the trypanosomes were very numerous. Fig. 7 might be a myelocyte; it contains moderate-sized chromatin bodies. Fig. 8 is a distorted cell with many fine granulations in its substance. Figs. 9 and 10 are typical cells of the endothelial type. The first of these shows a large ring-shaped chromatin inclusion, which may possibly be the remains of the nucleus of an ingested trypanosome. In the protoplasm of the second will be seen very fine dust-like granules.

The endothelial cells (figs. 11 to 16) are from a totally different source. They were seen in large numbers in a peritoneal exudate which had resulted from the inoculation by one of us (C. M. W.) of *Leishmania tropica* into the peritoneal cavity of a mouse. They are remarkable on account of their extraordinary phagocytic activity, for they are evidently ingesting every type of smaller cell (lymphocytes and polymorphonuclears, &c.) in the exudate. After ingestion the nuclei of these cells undergo digestion with the result that all kinds of cell inclusions are produced. In the case of the lymphocyte nuclei (figs. 13 and 15) the process of digestion results in ring-shaped structures, with chromatin centres which are indistinguishable as far as one can judge from Leishman's [1] fig. 13 in his first paper.

Fig. 11 is an endothelial cell and contains a polymorphonuclear leucocyte, a lymphocyte, and a chromatin inclusion of uncertain origin. Fig. 12 shows many moderate-sized inclusions which probably have resulted from the disintegration of some ingested nucleus. Fig. 13 illustrates an intermediate stage of the nuclear degeneration of a lymphocyte, all stages of which are well shown also in fig. 15. Fig. 14 is a smaller cell showing two inclusions, one of which has a definite ring structure resembling very closely the inclusions seen in

* Dr. C. W. Daniels has very kindly permitted us to use the details of this case, and has also allowed us to reproduce the cells from the Rhodesian case of human trypanosomiasis.



C. M. W. del.

FIGS. 1—6. From the case of anæmia from China.
FIGS. 7—10. From case of Rhodesian Trypanosomiasis.
FIGS. 11—16. From peritoneal exudate of mouse.

For detailed description of Figures see text.

To illustrate a paper on "Cell Inclusions in the Leucocytes of Blackwater Fever and other Tropical Diseases," by GEORGE C. LOW, M.A., M.D., C.M., and C. M. WENYON, M.B., B.S., B.Sc.

figs. 2 and 3. At fig. 16 are two free lymphocytes and one endothelial cell containing two recently ingested lymphocyte nuclei and a peculiar body probably of the same nature as that in fig. 13.

As regards the origin of the various endothelial cells pictured in the plate those found in the peripheral blood most probably are derived from the vascular endothelium, while those of the peritoneal exudate of the mouse must be derived from the exfoliated peritoneal endothelium. The kind of degeneration exhibited by the ingested lymphocytes in the peritoneal cells of the mouse supports very strongly the view that the similar bodies seen in the endothelial cells of the peripheral blood have had a similar origin.

As has already been stated endothelial cells are not necessarily found in all cases of blackwater fever. The blood of the young adult referred to gave the following differential count. Unfortunately a total leucocyte count per cubic-millimetre could not be made, but from the appearance of the films a fairly marked leucocytosis had been present:—

DIFFERENTIAL LEUCOCYTE COUNT.

	Number counted.	Percentage.
Polymorphonuclear	394	78.8
Large mononuclear	3	0.6
Lymphocytes	89	17.8
Eosinophile	3	0.6
Transitional	8	1.6
Mast cells } Chrome cells }	3	0.6
Myelocytes	—	—
	500	100.0

The blood when taken was extraordinarily thin and watery and spread on the films very badly. There was a marked tendency to rouleaux formation and a sticking together of the reds. Marked poikilocytosis was present, there were many megalocytes, and one normoblast and one megaloblast were seen. The evidence then was that of a severe anæmia. No endothelial cells were present, nor could any chromatin inclusions be detected. Differentially the blood showed an increase of the polymorphonuclear leucocytes. There were no signs of any malarial parasites.

The case was a severe and fatal one. The patient had only been abroad for fourteen months, having served that time in Northern Nigeria. During that time he suffered from several small attacks of malaria and took quinine irregularly, but had had no blackwater fever. He was also somewhat addicted to alcohol. After his return to England he had further relapses of malaria, after one of which blackwater fever developed. As just mentioned, symptoms of great severity quickly developed, a semi-comatose condition appearing on the third day of the illness, suppression of urine on the fourth day, complete unconsciousness on the fifth, and death on the sixth. The patient never seemed to be able to combat the toxæmia from the beginning. The absence of endothelial cells and cell inclusions is interesting, and may be important in view of the severity of the case.

It seems an undoubted fact that these endothelial cells, in whatever situation, are derived from the lining endothelium, and what causes their exfoliation remains a mystery, for it does not seem to have any definite relationship to the severity of the condition producing it. The same may be said of the cell inclusions which appear in large numbers in some conditions, while not at all, or very scantily, in others. As far as one can judge then from the varying origin and occurrence of these inclusions it does not seem legitimate at present to associate them with any particular disease, and in our opinion there now seems to be no possibility of them being parasitic in nature.

Certain peculiar looking bodies recently described by Coles [8] in a blackwater fever blood resemble artefacts more closely than anything else. They are certainly not parasites, and we have never seen such appearances in the many blackwater bloods we have examined. The suggestion put forward in the same paper that the blood of the inner viscera, bone marrow, and lymph glands should be examined for protozoa has, of course, been done repeatedly by competent observers, but so far with negative results.

Apart from the cell inclusions in the leucocytes, the etiology and significance of which have been described above, no other appearances resembling protozoal parasites, as far as we know, have been seen or described in the blood of blackwater fever by the many investigators who have studied the disease. Anthony has, of course, described spirochætes, but as no one else has confirmed this statement, his observations must be looked upon with doubt. Though looking for these specially we have never succeeded in seeing anything in the slightest degree resembling such organisms.

LITERATURE.

[1] W. LEISHMAN: "Cell Inclusions in the Blood of a Case of Blackwater Fever," *Journal of the Royal Army Medical Corps*, vol. xviii, No. 5, May, 1912.

[2] G. C. LOW: "Cell Inclusions in the Blood of Blackwater Fever and other Tropical Diseases," JOURNAL OF TROPICAL MEDICINE AND HYGIENE, vol. xv, No. 11, June 1, 1912.

[3] W. LEISHMAN: "Cell Inclusions in the Blood in Blackwater Fever: Second Note," *Journal of the Royal Army Medical Corps*, vol. xix, No. 2, August, 1912.

[4] W. LEISHMAN: "The Etiology of Blackwater Fever," *Transactions of the Society of Tropical Medicine and Hygiene*, vol. vi, No. 1, with discussion by Wenyon and others, November, 1912.

[5] ALDO CASTELLANI: "Note on Certain Cell Inclusions," JOURNAL OF TROPICAL MEDICINE AND HYGIENE, vol. xv, No. 23, December 2, 1912.

[6] SCHILLING-TORGAU: "Concerning the Origin and Significance of Leishman's Chrome Cells in Blackwater Fever (the Basophile Granular Leucocyte of Ehrlich)," JOURNAL OF TROPICAL MEDICINE AND HYGIENE, vol. xv, No. 24, December 16, 1912.

[7] ANDREW BALFOUR: "A Case of Blackwater Fever showing the Cell Inclusions of Leishman," JOURNAL OF TROPICAL MEDICINE AND HYGIENE, vol. xvi, No. 3, February 1, 1913.

[8] A. C. COLES: "Protozoa-like Structures in the Blood in a Case of Blackwater Fever," *Lancet*, May 3, 1913.

THE CULTIVATION OF THE BACILLUS OF LEPROSY.

By HENRY FRASER, M.D.Aberd.

Director, Institute for Medical Research, Federated Malay States.

IN your journal of October 15, 1912, p. 307, directions are given by Professor Creighton Wellman and Dr. Hand for the preparation of Wellman's placental agar. The method is that already described by Professor Wellman in the *Centralblatt für Bakteriologie* (p. 143) of August 24, 1912, and similar to that described by Professors Duval and Wellman in your journal of July 15, 1912, p. 221.

For the cultivation of the *Bacillus lepræ* Dr. Bayon has also employed a placental agar. The method for the preparation of his medium is not described in his published papers, but in response to a letter the necessary information was kindly furnished by him. His procedure differs in some respects from that employed by Professors Duval, Wellman and Dr. Hand.

During the past nine months we have carried out experiments with a view to the cultivation of the bacillus of leprosy. A placental agar was prepared in accordance with the directions given by Professor Wellman in the *Centralblatt* referred to. In this country the placental extract when mixed with equal parts of 2 per cent. agar does not set properly; a 4 per cent. agar was therefore employed.

On October 11, 1912, thirty tubes of this placental agar were inoculated with nodules of leprous tissue removed under aseptic precautions and swarming with leprosy bacilli.

The inoculated tubes were incubated at 37° C. After forty-eight hours two of the tubes were seen to be contaminated. Incubation of the remaining tubes was continued and from time to time a small quantity of sterile distilled water was added to each tube in order to keep the medium moist.

These tubes have now been under observation for seventy days. In none of them is there any evidence of growth or multiplication of the bacilli.

Tubercle bacilli inoculated on this medium grow slowly; the growth is not to be compared with that obtained on a blood-agar prepared by mixing glycerine-agar with an equal quantity of citrated human blood.

On September 26 thirty-five tubes of placental agar, prepared in accordance with Dr. Bayon's directions, were similarly inoculated with nodules of leprous tissue, incubated at 37° C., and kept moist in the manner already described.

These tubes have now been under observation for eighty-five days. In none of them is there any evidence of growth or multiplication of the bacilli.

Professor Wellman and Dr. Hand state that the placental agar can be prepared by the merest tyro in bacteriology; to this statement I must take exception. It can only be prepared by one trained in bacteriological methods and with a properly-equipped laboratory at his disposal. It is wrong to encourage amateur bacteriologists in this way and to delude them into the belief that the culture of the leprosy bacillus is a simple matter. Such action can only further intensify the present confusion.

They further state that "the acid-fast organisms, either of human or rat origin, grow on this medium so readily that *microscopic* growth can be discerned in from five to seven days," and in the *Centralblatt* already referred to Professor Wellman states that "the acid-fast organisms from bits of leprous tissue either of human or rat origin grow so readily that *macroscopic* growth can be discerned in from five to seven days." Microscopic growth can, I assume, only be detected in films prepared from the inoculated nodules of tissue. In such films we have invariably found numbers of acid-fast bacilli, but in no instance have we been able to convince ourselves that the organisms are more abundant than they were in the tissue at the time of inoculation. We have never discerned a macroscopic growth of acid-fast bacilli after from five to seven days nor at any later period.

The conditions under which our work is carried out are most favourable. The leper asylum is situated within half a mile of the Institute, it contains more than 250 patients. Selected cases come willingly to the Institute, so that it is easily possible, under aseptic conditions, to transfer the leprous tissue directly from the patients to the media. In this way materials have already been obtained from twenty-two patients. The tissues were invariably obtained from non-ulcerated cases. From ulcerated cases of the disease it is possible to grow all sorts of organisms, and equally so from tissues removed *post-mortem*, more especially in the Tropics.

Inconsistency and pleomorphism are the outstanding features of the recent publications on the subject of leprosy.

CIRRHOSIS OF THE LIVER OF MALARIAL ORIGIN.

By LUCIUS NICHOLLS, B.A., M.B., B.C.

Pathologist, &c., to the Government of St. Lucia, British West Indies.

CIRRHOSIS of the liver is a common condition of many tropical countries, and numerous authorities have asserted that some cases are caused by repeated attacks of malaria, but this has been disputed, and at the present time there appears to exist much doubt that malaria is ever a cause of the condition. The pathology of the disease has been but scantily described, and this possibly accounts for the existing uncertainty.

Hepatic cirrhoses can be divided into two main classes—the multilobular portal type, and the monolobular biliary cirrhosis. In the former, fibrosis takes place around areas composed of numerous lobules, whereas in the latter the fibrous tissue is increased primarily around the bile capillaries and single lobules of liver tissue; the former is the common disease of heavy spirit drinkers, and need not be further considered. Cirrhosis, which is initiated by malaria, falls into the second group.

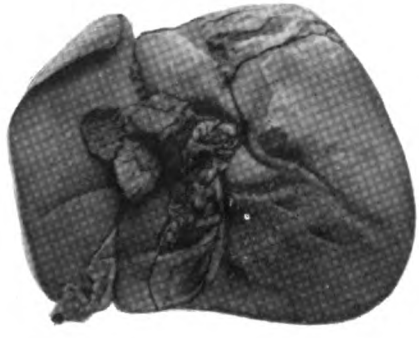


FIG. 1.

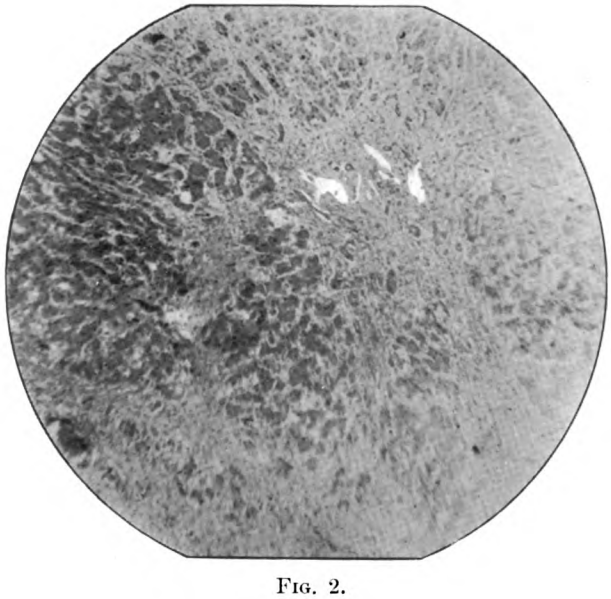


FIG. 2.

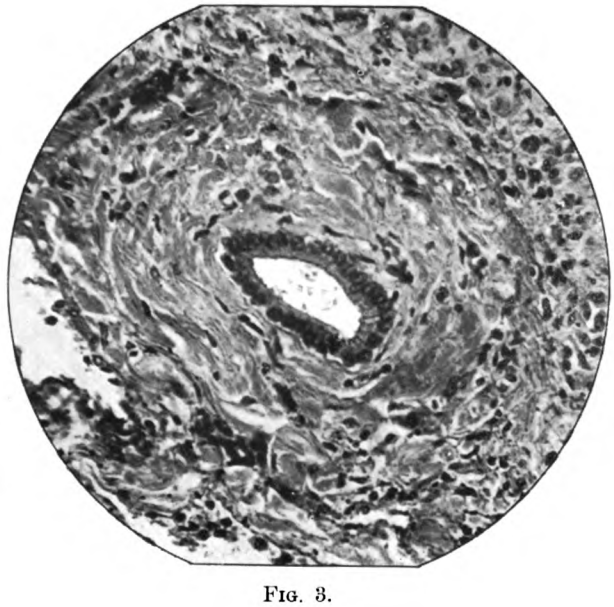


FIG. 3.

To illustrate paper by Dr. LUCIUS NICHOLLS on "Cirrhosis of the Liver of Malarial Origin."

Hanot and the French school were the first to separate biliary cirrhosis, but some confusion has since arisen from the fact that in the later stages the tissues are apt to undergo multilobular fibrosis as well, and thus obscure the original picture. Numerous very long names have been suggested to distinguish the various clinical types of biliary cirrhosis, and these depend upon the relative sizes of the liver and spleen, or the period in the disease in which enlargement of one or other of these organs first becomes demonstrable.

Biliary cirrhosis must originate as an ascending or a descending inflammation of the bile-ducts or capillaries, and for this the causes in various cases will be different.

If ascending catarrh was a common cause, an initial dyspepsia and a concomitant swelling of the pancreas would be expected. Therefore the majority of cases are probably due to some poison excreted by the liver and irritating the bile-ducts in its passage along them or to a damming up of bile by pressure from below.

There is a cirrhosis somewhat of the nature of that which I am considering which is due to congenital obliteration of the bile-ducts.

In malarial cirrhosis, the liver is moderately enlarged, its surface is smooth, the capsule is greatly thickened, and the peritoneal attachments are thick, hard, and fibrotic. There are numerous adhesions binding the liver to the diaphragm and surrounding organs. The changes which have taken place around the gall-bladder and transverse fissure are of the greatest importance. The lymphatic glands in this neighbourhood are much enlarged and bound down by thick, fibrous adhesions to the transverse fissure. The entering bile-duct and vessels are difficult of dissection, for they are firmly adherent to each other and matted together by fibrous bands. The walls of the gall-bladder are much thickened and the viscus is bound down to the adjacent capsule. The substance of the liver is hard and firm, with a dark mottled colour on section; islets of glandular cells stand out above the surrounding adventitious fibrosis.

Fig. 1, a photograph of this condition, shows these points; note the enlargement of the lymphatic glands, and the mass of fibrous bands in the transverse fissure. Also the shrunken, bound-down appearance of the gall-bladder. The thickening of the peritoneum at its reflections is well shown.

In Hanot's hypertrophic cirrhosis these changes in the transverse fissure and gall-bladder are rarely, if ever, present.

Microscopical sections of malarial cirrhosis show that the fibrosis has taken place around single lobules, and there is an enormous increase in the fibrous tissue around the bile capillaries. Fig. 2 shows this monolobular cirrhosis. Fig. 3 is a photograph of a bile capillary, and shows the massive increase of fibrous tissue around it.

The fibrous tissue of the liver capsule and the subjacent tissues may be even more than $\frac{1}{8}$ in. thick.

In *post-mortems* on chronic malarial subjects considerable perisplenitis and fibrous adhesions to the diaphragm and surrounding peritoneum are present, frequently also there is perihepatitis and various adhesions in connection with the liver.

Enlargement and swelling of the liver takes place at each attack of malaria, this is especially well marked in the case of children.

The production of this cirrhosis depends upon the presence of adhesions in the transverse fissure of the liver, thickening of the walls of the gall-bladder, and swelling of the neighbouring lymphatic glands.

The sequence of changes appears to be: (1) The formation of adhesions, and enlargement of lymphatic glands, which press upon the bile-duct; (2) the swelling of the liver at each attack of malaria; (3) as the adhesions and perihepatitis increase, the organ is held as in a vice, and the glandular swelling must take place against considerable internal pressure; (4) thus there is an increased internal pressure, acting against pressure on the bile-ducts and in the gall-bladder. Therefore fibrous tissue must be formed around the bile capillaries as a compensatory act; (5) malarial "toxins" are formed in the liver, and being excreted under unusual pressure along the bile capillaries, add a further irritating factor.

The deleterious products, which should normally be excreted with the bile, are absorbed into the system and cause the enlargement and profound changes which take place in the spleen.

I therefore form the opinion that malarial cirrhosis is primarily of a mechanical nature, and the adhesions and capsular thickening so frequently observed in *post-mortems* on malarial subjects have been unusually accentuated around the transverse fissure and gall-bladder, and the *post-mortem* changes in this area are almost pathognomonic of malarial cirrhosis, and serve to distinguish it from allied monolobular biliary cirrhosis.

THE METEOROLOGY OF MALARIA.

By Matthew D. O'Connell, M.D.

In continuation of previous remarks on this subject, I give below two observations of the dry and wet bulb temperatures of the atmosphere at Puttalam and at Kurunegala, in Ceylon, for which I am indebted to Mr. Bamford, the acting superintendent of the observatory at Colombo.

Puttalam.

1911	Temperature of air, F.		Wind	
	Dry	Wet	Direction	Velocity per hour
October 3, 3.30 o'c. p.m.	75.9°	73.9°	SW	11 miles.
October 4, about 5.30 o'c. a.m.	72.6	71.3	S	5 ,,

From these observations it is seen that the *dry* bulb temperature of the air fell 3.3° F., or at the rate of 0.2357° per hour during the night, and the wet bulb temperature fell 2.6°, or at the rate of 0.1857° per hour.

At Kurunegala on the same night the atmospheric conditions were as follows:—

1911	Temperature of air, F. Dry	Wet	Wind Direction	Velocity
October 3, 3.30 o'c. p.m.	79.9°	74.8°	Not given	
October 4, about 5.30 o'c. a.m.	74.8	71.0	,,	,,

From these observations it is seen that the dry bulb temperature fell 5.1°, or at the rate of 0.3642° per hour, and the wet bulb temperature fell 3.8°, or at the rate of 0.2714° per hour during the night of October 3 to 4 at Kurunegala. From these figures I construct the two tables given below, showing approximately the hourly atmospheric conditions at Puttalam and Kurunegala, and give for comparison the atmospheric conditions having the nearest dry bulb temperatures which were found, by actual observation in the Lancashire cotton sheds, to raise body temperature. To these tables I have added the drying power of the air in each atmosphere to make clear the rate of loss of heat from the body by evaporation.

In the tables below it is seen that exposure to certain atmospheric conditions in the Lancashire cotton sheds for less than *four* hours raised the body temperature of many of those so exposed above 37.7° C. (100.0° F.). It can also be seen that the impediment presented to loss of heat from the body by the atmospheric conditions for many hours of the night, both at Puttalam and Kurunegala, was even greater than in the atmosphere of the cotton sheds. Must not, then, exposure to the night atmospheric conditions at Puttalam and Kurunegala for *fourteen* hours raise the body temperature of many even higher than 37.7° C. (100° F.)?

The inhabitants of Puttalam and Kurunegala then were immersed in an atmosphere which raises body temperature and accelerates the pulse and respiration for *fourteen* hours on the night of October 3 to 4, 1911. For them there was no escape from it until sunrise, when the atmospheric temperature begins to rise and the air again becomes gradually drier.

It seems to me that nightly, *i.e.*, intermittent, exposure to such atmospheric conditions for any length of time must inevitably produce an intermittent fever in many of those exposed. Perhaps it was recognition of the fact that ague, whatever its cause, does become prevalent under such atmospheric conditions, which of old led to their being described as bad air (mal'aria). The application to a disease of the name given to the conditions believed to cause it is both common and scientific.

Puttalam, 1911	Atmospheric conditions at Puttalam, Ceylon, during the night of October 3-4, 1911. Temperature of air, F. Dry	Wet	Drying power of air per 10 c. ft. Grains	Wind Direction	Velocity per hour	Atmospheric conditions which raised body temperature in cotton sheds of Lancashire. Temperature of air, F. Dry	Wet	Drying power of air per 10 c. ft. Grains	Degree to which body temperature was raised by exposure in cotton sheds. Body temperature, F.	Pulse	Respiration
October 3, 3.30 o'c. p.m.	75.9°	73.9°	10.0	SW	11 miles	76.0°	72.0°	20.0	99.4°	88	20
,, 4.30 ,,	75.6	73.7	9.5			75.5	70.5	25.0	99.4	132	22
,, 5.30 ,,	75.4	73.5	9.5			75.5	70.5	25.0	99.4	132	22
,, 6.30 ,,	75.1	73.3	9.5			75.0	69.5	26.0	100.2	110	18
,, 7.30 ,,	74.9	73.1	9.0			75.0	69.5	26.0	100.2	110	18
,, 8.30 ,,	74.7	72.9	9.0			75.0	69.5	26.0	100.2	110	18
,, 9.30 ,,	74.4	72.7	8.5			74.0	70.0	19.0	100.0	98	22
,, 10.30 ,,	74.2	72.6	8.0			74.0	70.0	19.0	100.0	98	22
,, 11.30 ,,	74.0	72.4	8.0			74.0	70.0	19.0	100.0	98	22
October 4, 12.30 o'c. a.m.	73.7	72.2	7.5			73.5	68.0	24.5	100.0	90	22
,, 1.30 ,,	73.5	72.0	7.5			73.5	68.0	24.5	100.0	90	22
,, 2.30 ,,	73.3	71.8	7.5			73.5	68.0	24.5	100.0	90	22
,, 3.30 ,,	73.0	71.6	7.0			73.5	68.0	24.5	100.0	90	22
,, 4.30 ,,	72.8	71.4	5.0			72.5	68.0	24.5	100.0	90	22
,, about 5.30 o'c. a.m.	72.6	71.3	6.5	S	5 miles	72.0	65.0	29.0	99.6	Not given	

Kurunegala, 1911	Atmospheric conditions at Kurunegala, Ceylon, during the night of October 3-4, 1911. Temperature of air, F. Dry	Wet	Drying power of air per 10 c. ft. Grains	Wind Direction	Velocity	Atmospheric conditions which raised body temperature in cotton sheds. Temperature of air, F. Dry	Wet	Drying power of air per 10 c. ft. Grains	Degree to which body temperature was raised by exposure in cotton sheds. Body temperature, F.	Pulse	Respiration
October 3, 3.30 o'c. p.m.	79.9°	74.8°	27.4			80.0°	73.0°	36.0	99.2°	90	16
,, 4.30 ,,	79.5	74.5	26.5			79.5	74.5	26.5	100.2	90	24
,, 5.30 ,,	79.1	74.2	25.6			79.0	73.5	28.0	100.3	110	24
,, 6.30 ,,	78.8	73.9	25.4			79.0	73.5	28.0	100.3	110	24
,, 7.30 ,,	78.4	73.7	24.2			78.5	73.5	25.5	99.6	116	22
,, 8.30 ,,	78.0	73.4	23.4			78.0	73.5	25.5	100.0	100	30
,, 9.30 ,,	77.7	73.1	23.1			78.0	73.5	25.5	100.1	100	18
,, 10.30 ,,	77.3	72.9	22.0			77.0	73.0	20.0	100.1	100	18
,, 11.30 ,,	76.9	72.6	21.5			77.0	73.0	20.0	100.1	100	18
October 4, 12.30 o'c. a.m.	76.6	72.3	21.5			77.0	73.0	20.0	100.1	100	18
,, 1.30 ,,	76.2	72.0	21.0			76.0	72.0	20.0	99.4	88	20
,, 2.30 ,,	75.8	71.8	20.0			75.5	70.5	24.5	99.4	132	22
,, 3.30 ,,	75.5	71.5	20.0			75.5	70.5	24.5	99.4	132	22
,, 4.30 ,,	75.1	71.2	19.5			75.0	69.5	26.0	100.2	110	18
,, 5.30 ,,	74.8	71.0	19.0			75.0	69.5	26.0	100.2	110	18

NATIVE TREATMENT OF SLEEPING SICKNESS—A TRIAL.

By Alexander Brown, M.B., Ch.B.
Serenje.

In Serenje and district there is a persistent rumour that people have had human trypanosomiasis and been cured by native remedies. After consulting with one or two friends, and having a patient suffering from this disease, I thought I might test this rumour. Now that it is done I have come to the conclusion that the native remedies for sleeping sickness are as efficacious as that for persistent vomiting, which the great divine, John Wesley, prescribed as an infallible cure, "Place a puppy on the belly!" The uncle of the sick boy, who came in, said he had had it and was cured. The chief of a near village said he had had it and was cured. Fully realizing the responsibility I was taking upon me, I asked the latter, who said he knew the medicine, to bring it and let me see him administer it. The medicine consisted of the bark scraped off a tree called Musolkwe. It was a coarse, reddish, tasteless, and insoluble powder, and this was how it was given. There was a basin of water for the patient in which to rinse his hands, a small tin can, and a native cooking-pot. The empty pot was put on the fire and made thoroughly hot. About two tablespoonfuls of meal, made from Indian corn, and about 8 oz. of cold water were placed in the tin can. The patient was told to rinse his hands with the cold water. When the pot was thoroughly hot about 2 oz. of the mealy water was put in and then the coarse reddish powder. It boiled up at once. The patient was told to stand up. Then he had to jump over the pot; then he had to jump back again. He then squatted down at the pot and had to dip his fingers and lick the medicine off his fingers. He naturally complained about it being too hot. He repeated the dipping and licking process, perhaps ten times, and might have swallowed from half to one teaspoonful. The next process was the anointing of his body, arms, legs, face, head, &c. He had to do it himself, and a most perfunctory anointing it was. He could not have put on more than half an ounce of the liquid. "What next?" "He must go to the stream and wash." "Could he not wash here?" "No, he must go to the stream." "Can we not carry him?" "No, he must walk." We went to the stream and he washed. We had to cross a cutting for irrigation in which the water was running. "Could he not wash here?" "No, it must be in the river." His washing in the river was much more thorough than his anointing with the medicine had been, and we returned to the house. The ceremony was over. I looked at the medicine and tasted it before throwing it away. It was dirty, red, and tasteless, with nearly the whole of the powder lying at the bottom of the vessel as a sediment.

"How often do you do this?" "Every four or five days if the sleep does not go away from his eyes." "I want to see you prepare the medicine: bring it to-morrow."

As I am not of the number who can get behind the native mind, I was surprised when the next day but one the medicine man turned up with half a dozen of the common shrubs which he said was the medicine they gave after the one which had been given. He was told to proceed. He broke up the leaves, branches, and roots of the shrubs and put them into a pot. Along with the shrubs he put about 10 oz. of water. On the top of this pot he put another pot, made some clay, and sealed the connection between them with the clay. The double pot was put on the fire: the upper one empty and acting merely as a tight-fitting lid; the lower one, from which the steam could not escape, containing the water and medicine.

When the whole of the water had turned to steam the patient was enveloped completely in a thick blanket. The double pot was put under the blanket. The upper one was then removed and the patient steamed in this way. He was urged to open his eyes and breathe freely. "Woe! woe!" cried he. And no wonder, for it must have been painful. I tried the steam and found the odour of it exactly like that of hot roasted potatoes.

My faith in the British Pharmacopœia is not boundless, but in native medicine it is altogether microscopic. They may have been hoodwinking me; one never knows. In any case, I think the tender mercies of the wicked are cruel.

Pellagra.—Grimm, writing on this subject in the *Journal of the American Medical Association*, vol. lx, No. 10, May 10, 1913, summarizes some facts as regards the epidemiology of the disease. He states that as regards:—

Race.—More cases developed among the whites than among the negroes.

Sex.—More cases occurred among the females of both races than among the males.

Age.—More cases occurred at ages between 20 and 40 years than at other ages.

Marital Condition.—Among the married and widowed pellagrins the females predominate; the single pellagrins are equally divided between the sexes.

Dates of Onset.—More cases had their onset during the months of May and June than in other months, and more in 1911 than in any previous year.

Environment.—More cases developed under conditions of poverty than of comfort, and more under conditions of comfort than of affluence.

Relationship of Cases.—More cases developed in the vicinity of other cases than otherwise.

Heredity.—None of the facts seem to indicate that pellagra is hereditary.

Food.—The food used by the people in whom pellagra is prevalent deserves consideration as a possible etiological factor.

The most promising field for the investigation of the etiology of pellagra is the food being used by the people in whom pellagra is developing.

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JUNE 2, 1913.

THE NECESSITY FOR AN ANNUAL HOLIDAY FOR FOREIGNERS RESIDENT IN THE TROPICS.

UNTIL the European goes to the Tropics to take up work there he has been accustomed to an annual holiday, it may be for a week or two only, yet it is a holiday, a period looked forward to with anticipation, and when the reality comes it is enjoyed, if for nothing else than that the routine of the daily life is broken. A sense of freedom enters into the pleasure of a holiday, as if man wished to bring it home to himself that he is not a slave to the round of custom, nor to the will of his employer. On reaching the seat of work in the Tropics, however, the young man finds that an annual holiday is not the rule, that his first spell of leave may be five or six years hence, but that then he will have six, or nine, or even twelve months' leave. To a lad of, say, 21, the unrelieved monotony of, say, a five years' spell of work is apt to tell on him. Everything in his environment lends itself to sameness. The weather follows an invariable monotony day after day, be it the wet season, or during the period when the sun blazes from a cloudless sky week after week, month after month, until one comes to object to its rays shining on even one's boots. The regularity of the weekly mail from Europe, the presence of the same companions at mess, at work, at games, and at every turn, begets a weariness in the daily round which gradually enthrals the mind and makes one become more or less of a machine. The life has its pleasures, no doubt, especially to men who have experienced the rough and tumble and uncertainty of city life in a large European city, but to the inexperienced youth it becomes intolerable at times and threatens to cause that indefinite condition known as a "nervous breakdown." The commonest cause of a so-called nervous breakdown is, no doubt, all too frequently excess of alcohol, but a certain proportion is due to anxiety on the part of the head or representative of a firm, bank, mine, plantation, &c., when troubles arise which threaten ruin to himself or his firm, producing insomnia and all its attendant evils. The young man, however, whose responsibility is small, is apt to get into a condition allied to nostalgia. It is not really the home sickness, the intense longing, of the mountaineer for his home, but it is a condition, a "habit" of mind, brought about by the monotony of environment which gradually develops and leads to a want of buoyancy and joyousness and to a mechanical routine of daily work devoid of interest. Apart, altogether, from the likelihood of drifting into alcoholic ways under such conditions, there is the danger of developing a frame of mind such as the exile feels, a hopelessness and helplessness which amounts at times to despair. It is true, few allow themselves to reach this stage or they are prevented doing so by the doctor or by friends; but no one with experience of the Tropics is ignorant of such cases, and there are many who, falling short of the more serious stages, yet advance far enough to make life miserable, although they may present a fair face to the public. To a man in the condition depicted there is but one cure, namely, to go home. A local change to some adjacent district or country is insufficient and practically useless. Unless he has been home once, that is, to his native place, there may be an alleviation but no cure for the depressed frame of mind. The glamour of the home and its perfections are upon him, and until he goes home these will not be got rid of. It is one thing setting out from home with the promise of youth upon one, it is another returning more or less a failure and finding that the sympathy of those at home wears off after a few weeks, and the young man is often only too glad to return to his work with a fresh outlook on life.

Without, however, reaching a stage of mental aberration such as that described above, there is no doubt that every man working in a tropical country requires a change if he is to be kept sound in body and mind. The tether of routine at times tells upon men, especially in the Tropics, to such an extent that the mere suggestion of a change is repudiated, and it may be with difficulty that such an one can be got to go away at all. The very fact of such a frame of mind is the best evidence for the necessity of insisting upon a change being taken; and the more the man tries to prove the uselessness of the move, the more the medical officer is strengthened in his opinion of the correctness of his judgment in advising it. To fall into a routine of work tends to produce a machine-like mind and not a thoughtful or alert intellect. Men reduced to mere machines may have their places in the work of any commercial or Government establishment, but young men selected for their abilities to go to the Tropics should not be allowed to run to waste in this fashion. It is to prevent their becoming so that a change is necessary and compulsory. The man will be able to do more work and better work after being absent from routine for a short spell; and apart from the service in which he is, there is the man himself to be thought of, for neither he

nor his family are calculated to be but mere drones in the world's work if allowed to side-track away from the active work on the main line of the world's doings. Some firms known to the writer make provision for their employees taking a few weeks' holiday yearly, which in no way interferes with the long leave which becomes due to them in course of time. The benefits of this arrangement are apparent in the whole atmosphere of such firms; their men are more alert, and there is a feeling of buoyancy abroad conspicuous by its absence in houses where the yearly holiday is unknown. The white man in the Tropics need only take example by the native servants; they holiday-make to an extent which their masters and mistresses find annoying, and their employers profess not to understand their doing so. We often hear men, both at home and abroad, who in the position of masters tell their staff that they never take a holiday, and the juniors should take example by them if they want to get on. These men become selfish, develop into mere machines, and are of little account in the world's work and anything but a comfort to their families or a good example to their employees. But a youth in the twenties cannot be dealt with as a man in the fifties without detriment to his mind and body. A common answer when a man in the Tropics is advised to go for a few weeks' holiday is that there is nowhere to go to. In a few, a very few, regions of the earth this may be true, but in 99 per cent. of instances it is not so; a short sea voyage is often possible, travel to the hills, to a neighbouring country—anywhere, in fact, away from the routine of office and of daily life.

There is no doubt that in many instances too much is expected of a young man engaged in a business house in the Tropics. After a service of, say two years, the head of his department goes home on holiday or sick leave, and the responsibility falls on the young shoulders. All may go well, but if a crisis arrives in business the inevitable breakdown follows due to exhaustion from want of sleep, loss of appetite, mental anxiety, with the result that the young man is sent home suffering from nervous breakdown to such an extent that he is terrified to face the ordeal again, and resigns from an employment which gave him the one great chance of his life. The wise master, employer, or head of the department should be able to detect when his clerk or assistant has had "enough of it." The doctor can tell the physical state, and may find nothing organically wrong, but the employer should keep his eyes open to the state of the young men, and be able to detect listlessness, so-called laziness, which is not really laziness but physical or mental inability to do the work assigned to them. The merciful master will make careful inquiries about his *protégé's* habits, &c., and if satisfactory will see to it that he has a holiday at once—not next year; the hard task-master will upbraid the youth for his laziness, cut down his salary, or dismiss him from his employment; when had he instead insisted on the youth taking a holiday, both the master and man would have benefited.

J. C.

Abstract.

PHLEBOTOMUS FEVER AND DENGUE.*

By Lieutenant-Colonel C. Birt, M.R.C.S., R.A.M.C.

The author began by saying that, after an incubation period of from four to seven days, phlebotomus or sand-fly fever is ushered in with violent headache, chiefly confined to the forehead and back of the eyes; pains in the calves of the legs; discomfort in the epigastrium; and stiffness of most of the muscles of the body: the face is deeply flushed and the features are swollen; the conjunctivæ are injected; vomiting occurs in a quarter of the attacks, and diarrhœa almost as frequently, but constipation is noted in the majority of instances; the temperature rises rapidly to 101° F. to 103° F., and falls gradually to the normal level on the third or fourth day; the pulse remains slow throughout the illness; leucopenia, with a relative decrease in the polymorphonuclears, is an almost constant sign; there is considerable debility during convalescence; in an epidemic, more than 90 per cent. of the cases are first attacks, hence a high degree of immunity is afforded after recovery. A historical account of the disease is then given.

In the year 1908 Doerr announced the results of his experiments on the infectivity of the blood of the Dalmatian summer fever, and on the mode of the transmission of the virus by the phlebotomus. Since then the closely related ailments in Malta have been investigated in a similar manner. Tedeschi and Napolitani have made a similar inquiry into the nature of the Italian "summer influenza," and Kilroy has put to the test of experiment the causation of the fever as it occurs in Crete.

On combining the successful experimental results, it is found that:—

(1) The subcutaneous injection of blood or serum withdrawn during the first twenty-four hours of the patient's illness causes the disease.

(2) Inoculation with the filtrate obtained by passing the diluted blood through a porcelain candle which retains the *Micrococcus melitensis* also excites the disease.

(3) Feeding experiments with infected sand-flies have been successful on twenty-one occasions.

This evidence is sufficient to show that the fever is specific, and that it is caused by a filter-passing virus, which circulates in the blood during the first day of the illness, and that it is conveyed by the phlebotomus.

A phlebotomus when examined with the aid of a pocket lens is immediately recognized by its form and its very thick hairy coating, which obscures all the fine details of its structure. On removal of this dense clothing, slender microscopical differences may be observed in the venation of the wings, the length of the segments of the palps, the number and arrangement of the bristles or spines on the claspers,

* A paper read before the Society of Tropical Medicine and Hygiene, May 16, 1913.

&c., on which entomologists base a classification, but up to the present there has been little agreement amongst them; a species has been given more than one name, not only by different entomologists, but sometimes by the same.

Grassi has studied the life-history of the phlebotomus in Italy, and Marett in Malta. It breeds in caves, crannies of walls, and among heaps of stones. The eggs hatch in six to nine days after being laid; the larval stage lasts about eight weeks, and as pupæ they exist fixed in crevices in fragments of stone for a fortnight. These flies survive in captivity about ten days only, hence great difficulties are encountered in tracing their history. The phlebotomus is widely scattered throughout the tropical and sub-tropical world, and sand-fly fever is almost as broadly expanded.

Dengue breaks out in epidemics which are far more explosive in character than are those of sand-fly fever. The infection courses swiftly through a community, until almost all susceptible people have been attacked. In a few weeks its energy is expended. The rashes which occur in about 70 per cent. of the cases, and the greater severity of the pains, differentiate it from sand-fly fever.

Both infections may occur in the same locality. At Aden, in 1893, the summer outbreak of phlebotomus fever was followed by one of dengue in the autumn. No immunity was afforded by the former infection against the latter; whole families were seized; papular or urticarial rashes broke out in most cases. Colonel Birt was himself attacked at this time, and in his case joint pains were severe—much more so than in phlebotomus fever—and the initial rash was accompanied with itching of the palms and soles. Dengue has often visited Aden, and is well known to the native inhabitants, who call it "father of the knees."

In Gibraltar and Malta dengue has appeared among the troops in the autumn at the end of the sand-fly fever epidemic. The occurrence of rashes and breakbone pains, it is stated, were prominent symptoms, hence there was no confusion in determining the infections.

In Greece, Aravandinos say that dengue arises every few years in epidemic form along the coast, and that it can be distinguished readily from sand-fly fever, to which visitors to Greece are liable.

Many excellent accounts of dengue have been published, notably by Sandwith in Egypt, and by Bassett-Smith in Bombay. There is considerable variety in the character of the symptoms observed in the various epidemics. Bassett-Smith noted the absence of severe bone and joint pains, and of enlarged lymph glands. In an outbreak reported by Beveridge, in Natal, many of the cases of which were seen by Colonel Birt, swelling of the lymphatic glands was noted in 99 per cent. of the 325 cases, along with the classical signs and symptoms of the infection.

Aberrant cases of dengue, and they occur in every epidemic, closely resemble sand-fly fever. After a similar incubation period there is the same intense frontal headache, flushed face, injected and tender eyes, pains in the body and limbs, slow pulse, and leucopenia. Stitt found that the average white blood count in 100 cases of dengue was 3,200 per cubic millimetre. Moreover, the late eosinophilia observed by Balfour in Khartoum, by Harnett in Calcutta, and by others, also occurs in sand-fly fever, so that the infections cannot be separated by microscopical examination of the blood.

Graham, of Beyrout, was the first to investigate dengue experimentally. After feeding *Culex fatigans* on dengue patients, he caused them to bite susceptible people residing in places where the disease was absent. He thus transmitted the infection to six persons. He also induced the disease by inoculating a man with an emulsion of the salivary glands of an infected culex.

In 1906 Ashburn and Craig ascertained that the blood of dengue patients was infective, and that the virus passed through a filter which was impervious to the *Micrococcus melitensis*.

Summarizing successful experiments, one finds:—

Inoculation with the blood of dengue sufferers caused dengue eight times.

Inoculation with filtered infective blood induced the disease twice.

Inoculation with the salivary glands of an infected culex gave rise to dengue once.

Infection has been conveyed by infected culices eight times.

Infection has been conveyed by infected stegomyia once.

There are considerable differences in the infectivity of the virus in sand-fly fever and dengue. Blood extracted after the first twenty-four hours in the course of sand-fly fever no longer can excite the disease. It has failed to do so in every attempt (five experiments made). The blood of dengue patients with which the successful inoculations were performed was drawn off on the second to the fifth days of the disease.

Whereas phlebotomi are not capable of transmitting sand-fly fever until six days after feeding on a sand-fly fever patient who is in the first day of his illness, dengue has been conveyed by mosquitoes immediately after their meal of dengue blood; nevertheless, the virus survives in them, for they have conveyed the disease eight to twenty-seven days after feeding on a dengue sufferer.

Graham protected families from dengue by means of mosquito curtains. E. H. Ross extinguished epidemics of dengue which had been of yearly occurrence in Port Said by exterminating mosquitoes.

Evidence is accumulating that the *Stegomyia* is an agent in the propagation of dengue. Legendre concludes from a study of an extensive epidemic of dengue at Hanoi in 1910 that this mosquito was the responsible vector, since the outbreak was coincident with a great increase in their numbers, while other species were few.

There is a close resemblance between dengue, sand-fly, and yellow fever infections; they are all caused by some virus which circulates in the blood, and is capable of passing through a filter which retains bacteria; the onset of the fever is similar in

many instances, and during the first forty-eight hours of the illness it may be impossible to distinguish between the infections; even later a diagnosis on clinical grounds may be unattainable, for atypical cases of dengue and yellow fever may bear every likeness to phlebotomus fever. Hence, too, great stress should not be laid on the symptoms of individual patients during the course of an epidemic; it is the general type of case which will give the name to the outbreak.

Colonel Birt concluded his very interesting paper with the following statement:—

"Dengue, phlebotomus, and yellow fevers are caused by distinct but closely related kinds of virus.

"A fever lasting several days in which the examination of the blood for parasites, by culture, and by serum tests, is negative; characterized by slow pulse, leucopenia, and relative polynuclear decrease; occurring in a locality where mosquitoes are numerous, should be attributed to a virus carried by these flies, although some of the symptoms significant of dengue or yellow fever may be wanting."

Annotations.

Human Botryomycosis.—Opie, in the *Archives of Internal Medicine* (vol. ii, No. 4, April 15, 1913), describes a case of human botryomycosis of the liver. Botryomycosis in man, he states, was first described by Poncet and Dor. On the hand of a woman near the digito-palmar fold of the little finger an indolent red spot ulcerated and gave place to a pedunculated tumour the size of a small nut. In sections of the tumour they found the masses of coccus-like bodies to which Bollinger gave the name *Botryomyces*, and by personal observation convinced themselves of the identity of the bodies they observed with those found in the fungus-like growths from the spermatic cord of geldings. Poncet and Dor have perhaps diminished for subsequent observers the value of these bodies as criteria for the identification of botryomycosis by the interpretation which they have offered. They have maintained the untenable view, wholly unsupported by the bacteriologists who have studied botryomycosis, that the peculiar bodies are not micro-organisms, but products of the degeneration of tissue cells. They regard the coccus-like bodies as pyknotic nuclei. From the lesion Poncet and Dor isolated a staphylococcus, which, inoculated into the udder of an ass, produced a small pedunculated growth. No examination of the nodule was made. Poncet and Dor have described as botryomycosis three small pedunculated growths, two being on the hand and one on the most prominent point of the stump formed by amputation of the arm at the shoulder.

Faber and Ten Siethoff have described a group of little nodules on the border of the eyelid occurring at the site of stye in a boy who had tended a horse suffering with a fungoid growth from the cut spermatic cord. In the viscid pus squeezed from the lesion were mulberry-like masses with the structure of those which occur in the horse. Pedunculated tumours containing similar bodies have been observed in France by Sabrazes and Laubie (in one case on the auricle, in a second on the palm of the hand), and by Delore and Gauthier (in one case above the eyebrow, in a second on the finger). Similar observations have been made in Switzerland; Reverdin and Gulliard have described a pedunculated tumour the size of a pea on the palm of the hand, and Galli-Valerio has seen a nodule of similar size and shape on the anterior surface of the fore-arm.

The disease is apparently much more common in northern Africa than in Europe, and French physicians living in Algeria have described in considerable number instances of a similar but much more severe disease. Brault has described two cases in which small pedunculated tumours containing the characteristically grouped micro-organism have occurred on the fingers of women in Algeria. Legrain has described a considerable number of cases of botryomycosis. Attached to the dorsal surface of the right hand of a Berber woman he found a tumour the size of her fist; it consisted of five masses each pedunculated and the whole attached by a narrow base. A tumour in another Berber woman made its appearance on the stump of a finger accidentally amputated, and attained the size of a large mandarin. It was removed, but reappeared, forming a mass larger than before; the growth did not invade the underlying muscles or tendons. In a subsequent publication, Legrain described other growths on exposed surfaces, the largest of which was the size of a child's head. Somewhat similar observations have been made by Archibald on material sent to him from various parts of the Sudan; seven growths removed from the scalp, breast, arm, hand, foot or cheek of natives contained agglomerations of coccus-like micro-organisms identical with those peculiar to botryomycosis. The same bodies had been previously observed by a member of the laboratory staff in a growth removed from a camel. In one instance the lesion occurred in a native woman, aged 45, who had suffered with a swelling of the breast since childhood; it implicated the entire breast, resembled a fungoid cancer and exuded greyish-white pus from numerous sinuses. In another case a tumour of the scalp implicated the underlying bone and from sinuses on the surface thin, pus-containing yellow granules escaped.

Butler and Welsh, in New South Wales, found a swelling outside of the left orbit causing softening of the temporal bone in a child aged 4. The scant viscid pus contained numerous yellow granules which consisted of masses of cocci. In a Japanese Kayser and Gryns found the right foot swollen and riddled with sinuses from which matter escaped containing botryomycotic granules.

Cases of pseudo-botryomycosis have also been described. The author's summary of the subject, including the case seen by himself, is as follows:—

"Bacteriological examinations indicate that the disease of horses, cattle and swine known as botryomycosis is caused by a micro-organism resembling *Staphylococcus pyogenes aureus*, but characterized by the formation of compact colonies held together by a homogeneous material which forms a kind of capsule. About these colonies or granules which are formed only in the tissues there is suppuration and tissue formation producing a lesion which has all the characters of the infectious granulomata.

"Human botryomyocosis has been observed most frequently in tropical or subtropical countries, such as Algeria, the Sudan, Australia and Java. It has been observed in France and Switzerland, but heretofore has not been observed in the United States.

"The disease in man affects exposed surfaces such as the hands or face, and has repeatedly followed injuries of infected parts. Pedunculated masses of considerable size may be formed. They consist of newly formed fibrous tissue in which are foci of suppuration and sinuses opening on the surface. The peculiar botryomycotic granules are always present.

"Small pedunculated growths having the structure of exuberant granulation tissue have frequently been described as botryomycosis, although the micro-organism peculiar to the disease has not been discovered in the lesion. There is no demonstrable relation between these growths, which have been designated granuloma pyogenicum, telangiectatic granuloma or pseudo-botryomycosis, and botryomycosis as it occurs in man and lower animals.

"The case which has been described represents, as far as the author has been able to determine, the first instance of the disease described in the United States, and is, it seems, the first instance in which it has affected an internal organ. The disease has attacked a child aged 11. A massive lesion replaces almost the entire liver and consists of fibrous tissue and foci of suppuration within which occur botryomycotic granules in large number. It is not improbable that some peculiar mode of infection explains the unusual situation of the lesion. The child received milk from several cows, one of which died with a wasting disease, but no more definite history can be obtained. Botryomycosis has been observed in domestic animals in Missouri, where the human instance of the disease occurred."

The Endemicity of Yellow Fever.—Dr. Juan Guiteras has decided upon the reproduction of an old paper*, published by himself in 1888 (Annual Report of the Supervising Surgeon-General of the Marine Hospital Service), because it contains matter that is serviceable for the present study of the epidemiology of yellow fever, and also because the opinions of the author are frequently quoted without reference to this, his first paper on the subject, a paper which is rather inaccessible to-day to most readers.

* "Sanidad y Beneficencia," December, 1912.

As will be seen in the reading of the paper the author was by no means the first to state that the children of endemic areas were susceptible to yellow fever; but he believes he was the first to insist upon the importance of this class of cases, as well as of others of benign character, in maintaining the endemicity of the disease.

At the present time, the investigations as to the endemicity in the West Coast of Africa, and in Yucatan, revive the interest in these studies, and the apparition of fresh outbreaks, not clearly traceable to foreign importation, is giving rise, here and there, to a tendency to seek for other explanations of the epidemic phenomena than those that logically derive from the work of Dr. Finlay, of the American Army Commission, of the present author, the United States Marine Hospital Service, the French Commission to Brazil, and others who contributed to the building up of the new doctrine of the mosquito transmission of yellow fever.

Some authors are suggesting, for instance, the necessity of admitting the existence of another intermediary host, beside the mosquito and man, which might act as a storehouse of the endemic infection in the intervals between the outbreaks.

Others suggest the possibility of the existence of chronic parasite carriers to explain the continuance and perpetuity of the infection. In this connection Guiteras finds that recent investigators are inclined to ignore the data we possess as to the acquired immunity against yellow fever, and to maintain that frequent infections in the same individual are by no means rare.

Seidelin, of the Liverpool School of Tropical Medicine, believes he has discovered the parasite of yellow fever, but finds some degree of incompatibility between the manifestations of his parasite and the generally accepted facts in the epidemiology of the disease. Others such as sanitary officers who, either for want of the adequate means, or for the lack of the proper attention to details, or because of the existence of insurmountable local obstacles to the success of their anti-yellow fever campaigns, or because of the lack of confidence in the means now universally recommended, also have tried to throw doubt upon the generally accepted views of the etiology. They have failed to obtain the success that has signalized the work in Cuba, in Panama, in Rio and in Veracruz, the four foci where the infection was most intense, and where it should have been more difficult to eradicate it.

The ideas suggested by these observers Guiteras thinks are purely hypothetical, they lack demonstration, and in his opinion are not at all required for the explanation of the epidemiological phenomena.

He himself was always of opinion that the fundamental errors in the appreciation or interpretation of these phenomena proceeded from a lack of experience with the two phases of yellow fever epidemiology: the phase that one may call endemic, and the phase presented in the epidemic manifestations. It appears to him that the recent investigators of the disease are restricting themselves to

the viewpoint of tropical physicians of the past century, and that they are not sufficiently considering the experience acquired in the great migrations of the disease from its primitive foci.

It is well to remember the prejudices that blinded workers in Cuba with respect to these epidemic manifestations outside of the Tropics. Guiteras remembers well that in 1887, at the time when the Key West epidemic he describes in his paper was developing, he visited Havana for a few days. Upon stating his experience as to the large number of children affected, both of Cuban and American parentage, he was told by two of the most prominent practitioners of Havana that the disease could not be yellow fever, since this affection was extremely rare in childhood.

Upholding the same opinions that he maintained in his 1888 paper, he wrote the article on yellow fever in Keating's Encyclopædia of Children's Diseases, 1889, and in 1894 he published in the Crónica Médico Quirúrgica de la Habana a study of the infantile mortality in the city of Matanzas, showing that it was subject to the same reactions, with respect to yellow fever, as the infantile population of Key West.

Guiteras is perfectly correct in his contention, that workers of the present day are very apt to ignore the past literature of the subjects they are working upon. There has been much of this of late, with, in many instances, somewhat disastrous results. Such offenders will now have the chance of reading Guiteras's paper in the original.

The Health of the Canal Zone.—Gorgas, in submitting his report for the month of March, 1913, states that the total number of deaths from all causes among employees was 32, divided as follows. Disease 19, and violence 13, giving the annual average per thousand of 4.05 and 2.77 respectively.

Among employees for the month of March of each year the annual average death-rate per thousand was as follows:—

Date	Total	Disease
1905	12.27	—
1906	37.44	35.05
1907	40.23	36.28
1908	12.47	9.42
1909	8.76	6.84
1910	8.91	5.39
1911	10.76	6.76
1912	8.45	6.57
1913	6.82	4.05

The annual average death-rate per thousand in the cities of Panama and Colon and the Canal Zone, including both employees and civil population, for the month of March of each year was as follows: 1905, 36.51; 1906, 46.72; 1907, 32.32; 1908, 20.67; 1909, 17.07; 1910, 18.33; 1911, 22.22; 1912, 14.67; 1913, 19.32.

In segregating according to race, the annual average death-rate per thousand from disease among employees was: For whites 2.79, and for blacks 4.43, giving a general average for disease of 4.05. For the same month during 1911, the annual average death-rate per thousand from disease among whites was 3.88, and blacks 7.76, giving a general average of 6.76; and in 1912 from disease among whites 2.75, and blacks 7.90, giving a general average of 6.57.

Among employees during the month, deaths from the principal diseases were as follows: Duodenal ulcer, 2; lobar pneumonia, 3; tuberculosis, 7; ulcer of stomach, 1; leaving 6 deaths from all other diseases, and 13 deaths from external violence.

No cases of yellow fever, small-pox, or plague originated on or were brought to the Isthmus during the month.

On a Hitherto Unknown Cause of Disease in Man.—In a paper in the *Centralbl. f. Bakt.*, of March 15, 1913, Dr. O. L. E. de Raadt describes a parasite which he found in smears of the spleen of a soldier who died of a febrile malady which resembled in some ways malaria and typhoid fever. The liver was palpable, but the spleen extended to three fingers' breadth below the costal margin. No parasites were found in the peripheral blood, but in Giemsa-stained smears made from the spleen numerous blue ring- or bean-shaped structures were seen both in the red and white cells and also free. The largest of these had a diameter of 3 microns, and each had a comparatively large vacuole. The curious feature of this parasite, for the structures are supposed to be of this nature, is that prolonged staining with Giemsa for twenty-four hours does not bring out any nucleus, so that there can be no question of the structures being malarial rings. Reproduction appears to take place by simple division and by budding, which latter feature, together with its Gram positive staining reactions, suggests that the organism is related to the yeasts. The author has encountered the same organism in the spleen smears from two cases from Java, but only in small numbers, so that he was led to believe the organism to be harmless. However, the present case which is from Borneo contained such large numbers that he is convinced of its pathogenic nature, and suggests for the organism the name *Ovoplasma anucleatum*.

Spirochætosis.—In his first lecture in the Herter Foundation (*Bulletin of Johns Hopkins Hospital*, February, 1913), Professor George H. F. Nuttall reviews in a most interesting manner the present state of our knowledge of the diseases included under the name spirochætosis. Special attention is paid to the transmission by blood-sucking arthropoda. Spirochætes in birds were first discovered by Sacharoff in geese in the Transcaucasus in 1891, while Marchoux and Salimbene (1903) observed a similar disease in fowls in Brazil, a disease which is now known to occur in South-Eastern Europe, Asia, Africa, South America, and Australia, and in all places where it exists it is transmitted by the tick *Argas persicus*

as Marchoux and Salimbene first demonstrated. Professor Nuttall believes that Sacharoff's original spirochæte of geese, and called by him *Sp. anserina*, is identical with the *Sp. gallinarum*. The mortality in fowls varies from 40 to 100 per cent., and death takes place in anywhere from three to fifteen days. As regards the development of the spirochæte in *Argas persicus*, it is pointed out that the ticks are best rendered infective by maintaining them at a temperature of 30° to 35° C. after feeding on infected blood. If kept at a low temperature, 15° to 18° C., the spirochæte disappears very quickly from the alimentary tract, and the tick may bite repeatedly without producing infection. They may, however, be rendered infective after three months by placing them again at 30° to 35° C., when spirochætes reappear in the cœlomic fluid. After being taken up by the tick a certain number of the spirochætes degenerate, whilst others pass into the cœlomic cavity, where again some perish. The survivors then penetrate the various organs, especially the cells of the Malpighian tubules and sexual organs, in which they break up into a large number of small particles, coccoid bodies, which multiply by fusion, and give rise to large agglomerations. The coccoid bodies may also be found in the lumen of the gut and Malpighian tubules, and in the excreta. In the act of feeding the tick occasionally voids excrement, which is diluted with fluid from the coxal glands, and thus helped into the wound inflicted by the bite of the tick. Infection may take place without any escape of fluid from the coxal glands. By means of the coccoid bodies infection is transmitted hereditarily from one tick to another. Another species of Argas (*A. reflexus*) is also able to transmit the fowl spirochæte.

In reference to human relapsing fever in Africa mention is made of the fact that Dutton and Todd were the first in 1905 to show that transmission was effected by the tick *Ornithodorus moubata*, which also passed on the infection through the egg to the succeeding generation. A tick may remain infective for eighteen months or more after its initial infective meal of blood, as proved by Möller, who has also shown that infection may be transmitted hereditarily to the third generation of tick when the ticks are fed throughout the experiment on clean animals. Manteufel (1910) has shown that ticks may acquire an immunity to spirochætal infection, so that only a small percentage of any batch will become infective. In the tick *Ornithodorus moubata*, according to Leishman, the spirochætes invade the tissues and break up into granules. The gut with its contents, the Malpighian tubes, the sexual organs, and the excrement are infective when injected into susceptible animals, while the coxal secretion is always and the salivary glands nearly always negative. After ingestion the spirochætes disappear in nine to ten days, but reappear if the tick is placed at 35° C., when they are to be found in the cœlomic fluid. *Ornithodorus savignyi* has been shown by Brumpt to convey the human spirochæte of Abyssinia, while *O. turicata* is suspected in Columbia, *O. talaje* in Mexico and Central America, and *O. tholozani* in India (Quetta). Further, Sergent and Foley have shown that the *Argas persicus* may transmit the human spirochæte.

The author points out that the various names given to spirochætes of human origin in different parts of the world cannot be regarded as valid, for virulence and immunity reactions are not adequate tests of specificity. *O. moubata* has served for the transmission not only of *S. duttoni* and two other so-called species, *S. recurrentis* and *S. novyi*, which affect man in the Old and New World respectively, but it has also been found to transmit the fowl spirochæte. *S. duttoni* has, moreover, been successfully transmitted to rats by the rat-louse *Hæmatopinus spinulosus*. The author sums up this part of the lecture by stating that "There is every reason to suppose that a spirochæte capable of adapting itself either to a tropical African tick or to a rat-louse occurring all over the world, will be able to accommodate itself to a variety of human hosts."

As regards the transmission of relapsing fever by bed-bugs, the author records an experiment of his own whereby thirty-five bugs were transferred directly from an infected to an uninfected mouse which thus became infected. It is therefore concluded that bugs can occasionally transmit relapsing fever. As regards lice the most convincing results are those of Nicolle, Blaizot, and Conseil (1912). These observers found that the spirochætes disappear from the gut of the lice five or six hours after the feed, and none are to be discovered microscopically in twenty-four hours. After eight to twelve days active spirochætes reappear, at first short forms, but afterwards forms like those seen in the blood. Monkeys inoculated with the contents of lice crushed on the fifteenth day after the infective feed become infected. In man infection takes place by the infected lice being crushed on the excoriated skin, and smeared in by the fingers, or even by the transference of such infective material to the conjunctiva on the fingers. These authors proved, moreover, that the spirochætes are transmitted hereditarily to the offspring of the lice, for they found that eggs laid twelve to twenty days after the infection of the parent lice contained spirochætes. The crushed eggs were infective to monkeys. These facts refer to both *Pediculus vestimenti* and *P. capitis*, which appear to be the ordinary vectors in most parts of the world. Some interesting original observations of Mr. Cecil Warburton on the biology of the lice infesting man are described by the author.

Reference is made to the transmission of the African cattle spirochæte (*Sp. theileri*) by the tick *Boophilus decoloratus*, which again is able to transmit the infection to its offspring. The spirochætes occasionally found in horses and sheep are probably *Sp. theileri*.

According to Nicolle and Comte bats in North Africa suffer from typical relapsing fever due to *S. vespertilionis*, which may be conveyed by several of the ectoparasites of the bats.

Reference is made to the important discovery by Noguchi (August, 1912) of a means of cultivation of the blood spirochætes in sterile hydrocele, or ascitic fluid containing a piece of freshly excised rabbit's kidney.

In summing up, the author remarks that spirochætes are not specialized parasites. Infection may take place through the skin through a mucous membrane to which the spirochætes gain access by being deposited therein in the arthropod's dejecta, or by an infected individual scratching or rubbing himself with hands which have become contaminated with the contents of the vermin which they have crushed.

Transmission of Trypanosomes.—Mitzmain contributes a most interesting paper to *The Philippine Journal of Science* (*B. The Philippine Journal of Tropical Medicine*), vol. vii, December, 1912, No. 6, on "The Rôle of *Stomoxys calcitrans* in the Transmission of *Trypanosoma evansi*." This, of course, is a most important subject, and the author's careful observations ought to be closely studied. Many interesting experiments were done, and a series of photographs show how the flies were applied to the different animals. These methods should prove useful in dealing with other biting flies.

The conclusions which the author reaches at the end of his paper are as follows:—

(1) Only negative results were obtained in the attempts at direct mechanical transmission of surra with flies which were induced to bite healthy animals at intervals ranging from five minutes to three days after being permitted to complete the feeding upon infected animals. Thousands of *Stomoxys calcitrans* were employed in twenty-nine experiments involving the use of three horses, six monkeys, and twenty-two guinea-pigs.

(2) Twenty-seven experiments were performed in attempts to transmit surra by the interrupted method of feeding. All attempts proved negative *where a single application of a varying number of flies was used*, as many as thirty-eight on a horse, and a maximum of forty on a small guinea-pig. The intervals between feeding on infected and healthy animals averaged twenty-five to forty seconds in the two instances cited.

(3) In three trials interrupted feeding was employed in successive daily applications. In attempting to determine the minimum number of bites necessary to infect an animal, as high as forty were followed by negative results. The only positive result obtained was produced from a succession of 206 interrupted bites in which the flies were transferred immediately from the infected to the clean animal. The flies were applied thirty-two hours during a period of six days.

(4) The results of these experiments indicate that *Trypanosoma evansi* does not develop in the body of *Stomoxys calcitrans*. Ninety-four days was the longest period in which laboratory-bred flies were tested for a cyclical development, and sixty-seven days the maximum for wild flies.

(5) Organisms of surra were not found in *Stomoxys calcitrans* beyond eighteen hours after feeding on an infected animal, and the limit for infection by inoculation was ascertained in these experiments to be six hours.

(6) Pathogenic trypanosomes were found in the proboscis of the fly thirty seconds after feeding on infected blood. Within one minute and thirty seconds the organisms were not present in the mouth parts in a form capable of infecting by inoculation into guinea-pigs.

(7) The wounds made by the labium of *Stomoxys* were not found to be a suitable channel for infection. Consequently it is not likely that surra in domestic animals is produced through this avenue by external contamination, namely, fæces, mouth parts, and pulvilli of infected flies.

(8) The intimate relation in the feeding habits of *Stomoxys* and of house-flies has been pointed out. *Stomoxys* has been demonstrated to provide through its bites the infection of *Musca domestica* and other dung flies. These flies have been demonstrated to act as carriers, harbouring the surra organisms for several hours.

(9) No evidence was obtained to indicate that *T. evansi* is hereditarily transmitted to the offspring of *S. calcitrans*. The larva of this fly fed on surra blood does not continue to harbour the trypanosome and the fly is "clean" upon reaching maturity.

(10) It is demonstrated that the individual glass-tube method is the most suitable for applying flies in feeding on experimental animals and for keeping flies for long periods under laboratory conditions.

These experiments indicate that the *Stomoxys calcitrans* is not the transmitter of surra. If it is not, then what fly does transmit it? The answer to this will probably be found in one or other species of the Tabanidæ.

Health in the Philippine Islands.—Heiser, in his quarterly report of the Bureau of Health for the Philippine Islands (Fourth Quarter, 1912), states, as regards typhoid fever, that while not so spectacular, nor the cause of great public alarm, yet the constant increase in the number of cases of typhoid fever over a wide area of the Philippines is a greater menace than the outbreaks of cholera with which the islands had to deal some years ago. Active steps are being taken to educate the public with regard to the seriousness of this disease and the manner in which it may be avoided, and the steps which should be taken to prevent its spread. Blood examinations made of persons reported ill with fever show that the disease prevails extensively in Pampanga, Bulacan, Tarlac, Pangasinan, Union, and the lowland sections of the Mountain Province. He asks physicians to send to his office blood samples in the case of any continued fever that lasts over a week, in order that proper laboratory tests may be made to establish a diagnosis.

Plague.

The measures against plague described in the previous quarterly report were continued, but it

was deemed advisable to augment largely the force of men employed to carry out general cleansing, rat proofing and rat catching. The sanitary engineering division has issued many orders to abate nuisances with regard to rat runs. Particular attention is given to making new constructions rat proof. Hollow walls, ceilings, floors, &c., are forbidden.

During the latter part of December opportunities presented themselves in Manila for placing guinea-pigs in houses in which plague had occurred, and in two instances these test animals contracted the disease.

No further cases of plague have occurred in Iloilo since September 17, 1912. In all, there were nine cases, with nine deaths. The fact that all of these cases were confined to two houses, and that a rat-catching campaign extending over a period of three months failed to reveal any infection among rodents, somewhat supports the theory that perhaps this outbreak of plague may have been introduced into Iloilo by means of bed-bugs.

Bacillary Dysentery.

During the early weeks of October there was a marked diminution in the number of cases of this disease, and only a few scattered cases are now being reported. The apparent seasonal prevalence of this disease during the past few years has been most marked, which fact would seem to hold forth the hope that further advances in the study of its etiology may result in better methods for preventing its spread.

Segregation of Lepers.

During the quarter 284 lepers were collected from the Provinces of Zambales, La Union, Mountain, Ilocos Norte and Ilocos Sur, Cagayan, Isabela, Tayabas, Ambos Camarines and Albay, Sorsogon, Samar, Leyte, Surigao, Agusan, Misamis, Moro, Cebu, Bohol, Romblon, Mindoro, Occidental Negros and Oriental Negros, Iloilo, Capiz, Antique, and Palawan. It is interesting to observe that a more careful survey made of the more remote sections of the Island of Palawan shows that the belief heretofore entertained, that no lepers were present there, is erroneous. Three persons were actually transferred to Culion, and there is reliable evidence to show that a number of others are still at large.

With a few isolated exceptions, it is believed that all cases of leprosy recognizable as such are now in confinement, but as the incubation period of the disease is a prolonged one, it is very likely that many additional cases will come to light in the near future.

Notes and News.

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

At a meeting of the Society of Tropical Medicine and Hygiene, held at 11, Chandos Street, Cavendish Square, London, W., on Friday, May 16, 1913, the following gentlemen were elected Fellows:—

J. G. Becker, M.B., Transvaal.
Arthur D. Clanchy, L.R.C.P. and S.I., Dublin.
Charles Forsyth, M.D., F.R.C.S., Hong Kong.
E. Humphry, M.R.C.S., Townsville, Australia.
Oswald E. Jackson, M.B., South Rhodesia.
Lucius Nicholls, M.B., East Africa.
W. B. Nisbet, M.B., Townsville, Australia.
E. Olubomi-Beckley, L.R.C.P. and S. Edin., Sierra Leone.
Henry Priestley, M.B., Townsville, Australia.
Fred. D. Walker, M.B., Bolivian Survey Commission.
W. A. Young, M.B., Forfar.

GORDON MEMORIAL COLLEGE, KHARTOUM.

March, 1913.

Dr. Andrew Balfour begs to inform his friends and correspondents that, having been appointed Director-in-Chief of the new Wellcome Bureau of Scientific Research with headquarters in London, he is leaving the Sudan early in May. Dr. A. J. Chalmers, D.P.H., late of Ceylon, will succeed him as Director of the Wellcome Tropical Research Laboratories at Khartoum. From May, 1913, until further notice Dr. Balfour's address will be: Woodcote, Churt, Surrey, England.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the Journal of Tropical Medicine and Hygiene *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Boston Medical and Surgical Journal," May 8, 1913.

Infantile Beriberi.—Gregg states that infantile beriberi in the Philippines is a nutritional disease which occurs among native breast-fed infants. It causes about 25 per cent. of the total native mortality in the city of Manila. He believes that it is due to the absence of some as yet unknown nutritional substance in the breast milk of the nursing mother, and states that it has been successfully treated by the giving of an extract of rice polishings, which is believed to supply the nutritional substance absent in the mother's milk.

In the Philippines, where babies are almost always of necessity breast-fed, the reduction of the infantile mortality is dependent, even more than in other countries, upon the care and proper nourishment of the nursing mother.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the Journal of Tropical Medicine and Hygiene should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

A REVIEW OF A CLINICAL STUDY OF MALARIAL FEVER IN PANAMA.

By JOHN PELHAM BATES, M.D.
Ancon, Canal Zone, Panama.

II.

SYMPTOMS AND THE DIFFERENTIAL DIAGNOSIS OF MALARIAL FEVER.

IT seems at first thought superfluous to undertake at this late date a discussion of the symptoms or the differential diagnosis of malaria in an ordinary clinical study. But as I undertook to show in a previous paper that certain other diseases and their symptoms must have been included in the general descriptions of malarial fever, it follows as a logical sequence that I must hold some views in consonance with the general spirit of that paper with regard to the symptoms of an uncomplicated malaria, and also its diagnosis. Therefore, this review could not be complete without some expression of those views. Moreover, the character of the first paper precluded a discussion of the differential diagnosis of malaria from other diseases, even those diseases alluded to in that paper.

The nomenclature of the different varieties of malaria is not very satisfactory. The names tertian and quartan answer the purpose well enough when these two fevers pursue their normal course, but they do not always do so. In the presence of multiple generations of parasites both of these fevers change their characteristic febrile curve; in the former it becomes a quotidian fever, in the latter it becomes either a subtertian fever or a quotidian fever, depending of course on the number of sporulating generations of the parasite that may be present. Æstivo-autumnal malaria seems to be the term most generally adopted for the irregular, continued malarial fevers. But this term is not very applicable in the Tropics, for we have no summers changing to autumn, and these fevers occur with a fair degree of constancy throughout the whole year, although there is some seasonal incidence corresponding to the wet and dry seasons. Quotidian and subtertian are terms also suggested for these irregular fevers, but they, like the tertian and quartan, vary their characteristic febrile curve in the presence of multiple generations of parasites, and lose all semblance to a true quotidian or subtertian course. They may give rise to a chart which has an outline irregularly dentate, or in some instances sub-continuous, or at times almost a continuous fever.

On account of the inability to coin a satisfactory term, I shall in these papers adopt the term malarial fever to apply to all the malarias which do not pursue a distinctly tertian or quartan course, no matter which variety of parasites may cause the fever. The nature of this paper does not require a discussion of the tertian or quartan fevers, as they offer no difficulty for diagnosis so long as they maintain a normal course, and when, on account of multiple generations of parasites, they assume a type of fever that is quotidian or irregular, they will also be included under the term malarial fever. Therefore, the tertian and quartan as distinct entities will be dropped from the discussion of the differential diagnosis.

There is yet some confusion as to whether there is one or more varieties of parasites causing the irregular malarial fevers. Thayer and Hewetson [1] believed that there was only one variety of these parasites, and that the different forms seen in the blood of the periphery were merely different phases of development in the life of the same organism; the complete life cycle taking place in the internal organs, so that these various phases occurred only occasionally in the blood of the periphery, now at one stage, now at another, and thus giving rise to the idea of two varieties. The Italian [2] observers described two varieties of parasites, the æstivo-autumnal tertian parasite (subtertian) and the æstivo-autumnal non-pigmented parasite (quotidian). Mannaberg [3] described three varieties of parasites causing the irregular fevers, the malignant tertian (subtertian), non-pigmented quotidian, and pigmented quotidian. Craig [4] describes two, which he terms *P. falciparum* and *P. quotidianum*, and admits the possibility of still another; while Manson [5] agrees with Mannaberg, and suggests the possibility of three; namely, non-pigmented quotidian, pigmented quotidian, and subtertian, also pigmented. All of these varieties give rise to gametes of crescentic form.

I think my observation justifies me in assuming that there are only two varieties of parasites giving rise to the irregular fevers and having gametes of crescentic form, and that neither of these varieties are without pigment, and that Manson and Mannaberg's pigmented parasites are only an advanced stage of development of the so-called non-pigmented quotidian, which occur occasionally in the blood of the periphery. During my studies of the various malarial parasites in Panama I have found that the parasites most frequently present in the irregular varieties of malarial fever corresponded to the descriptions of the so-called non-pigmented æstivo-autumnal parasites, and also parasites from autopsy examinations in most cases bore out this likeness. Nevertheless I have found myself quite frequently confused in routine blood examination work in some of the stages of the development of these parasites by certain bodies containing pigment, in association with young and advanced ring forms, and at times with crescents and ovoid forms also. These pigmented bodies, when mature, occupy all or nearly all the red blood cell's substance, without increasing its size or decreasing it to any appreciable extent. In conjunction with these pigmented bodies, crescents were observed too often to be easily explained on the ground of an accidental mixed infection.

In fresh blood smears these pigmented forms are found occupying half to three-fourths and up to all of the red blood cell substance. The pigment is scattered throughout the body of the parasite, and is rather sluggish in motion. Its colour is brownish. The

body itself is a pale hyaline mass, flat and smooth, in contrast to the highly refractile, globular mass of the subtertian organism, at the same stage of maturity, which sometimes appears to be an oscillating droplet in the red blood cell. In the stained smears the pigment in this body is seen in small granules, and is brownish in colour, and scattered throughout the entire body. The chromatin is usually faint, and is arranged throughout the body in irregular lines. These bodies are apparently schizonts and a normal life phase in the development of the so-called non-pigmented æstival parasites; as I have said, they do not swell or shrink their erythrocytic host to any appreciable extent, but some shrinkage takes place in the body before sporulation occurs. At the same time of this shrinkage, aggregation of pigment takes place to about the centre of the organism. The body appears to be morphologically indistinguishable from the quartan parasites when the quartan is at the stage of development in which it occupies nearly all, or all, of the structure of the erythrocytes. Therefore, after James [6] had made painstaking studies of the quartan parasites in Panama, I reluctantly accepted these bodies as probable quartans, and if they appeared with crescents present in the same smears, they were then accepted as a mixed infection. But when I had an opportunity to view the life phase of the quotidian parasites in Bass's [7] cultures *in vitro*, in Panama, I again met with these same bodies just before sporulation occurred. There was also an intermediate phase *in vitro* between the large ring phase and this body just described, in which pigment is already beginning to occur. These intermediate phases later become the pigmented bodies alluded to, and as schizogony begins to take place, the brownish pigment accumulates centrally or slightly eccentrically in the organism. In Bass's cultures *in vitro* the pigmented bodies evidently became sporulates, as in the smears containing the sporulating phases these bodies had almost, or quite, disappeared from the scene.

The developmental morphology of these parasites terminating in the bodies spoken of and schizogony with later crescent forms may be described briefly. When the young ring forms have proceeded up to where they begin to occupy one-fourth or more of the erythrocyte as broad rings of cytoplasm, with a relatively large nuclear chromatin body, other forms will be occasionally observed which spread as a band of blue-stained cytoplasm across the entire diameter of the red blood cell; in this band-like body the chromatin nucleus is at or near the centre of the cytoplasmic band, and the chromatin is sometimes elongated or streaked throughout the organism. A later phase will show an oblong mass of cytoplasm occupying about one-third or more of the erythrocyte, with small amounts of pigment and a relatively large chromatin nucleus. The growth apparently continues, with a diffusion of the chromatin nucleus into wavy, irregular lines, sometimes blotches, throughout the cytoplasm and pigment, until the body has attained the diameter of its erythrocytic host. After this stage shrinkage occurs, while at the same time accumulation of pigment takes place in the centre of the organism, and later the body breaks up into spores.

It will be noted that the description of the different phases of development of these parasites is similar to Craig's [8] description of his so-called conjugating forms. And the final stage of this parasite before sporulation occurs gives rise to a pigmented body morphologically similar to Craig's "resting stage body," or resisting forms that are ultimately to give rise to a later brood of parasites, and relapse. I have never been able to follow in the blood of the periphery all these various phases in one single series of smears. They have been seen now in one smear, now in another, and in each the phases were various, some belonging to a younger age or an older age, as the case might be at the time of the examination. In one case all the forms of the life phases were present in the blood of the periphery, except schizogony and crescent forms. They began with small ring forms, and continued up to the large ring forms, with transverse band forms, oblong pigmented forms, and pigmented forms occupying half or more of an erythrocyte, and the final pigmented bodies free in the blood plasma. There were no sporulates or crescents seen. Forty-eight hours later, after sixty-five grains of quinine had been given, another smear disclosed only a few young ring forms and innumerable crescents. On account of the younger ring forms of parasites which are most frequently seen in Panama, corresponding morphologically to the so-called non-pigmented parasites, and the frequent co-existence of pigmented bodies and crescent forms with these ring forms, together with the life phases seen in Bass's cultures, I have been led to conclude that these were all life phases of the same parasite. And that this was not, as formerly believed, a non-pigmented forming parasite.

This conclusion is certainly in harmony with the clinical appearance of all cases of malaria in which there have been a few repeated attacks of fever, and also with autopsy findings.

I have never been able to see any patients in which there have been two or three attacks of fever without evidence of melanæmia. In the autopsy smears from the spleen and bone marrow pigment is always found, and usually a number of poorly stained shrunken hyaline bodies containing pigment in rodlets or granules. Marchiafava and Bignami [9] discussing the so-called non-pigmented æstival parasites of Marchiafava and Celli under the head of melanæmia, state that although they have seen parasites in the blood of the periphery and in the cerebral capillaries pursue their life cycle up to sporulating forms without the formation of pigment, they have not been able with great richness of material to see cases at autopsy without melanæmia, and that in the spleen there were both pigmented forms and pigment included in the leucocytes. On this account they expressed some doubt about there being a parasite which pursues its whole life cycle without the formation of pigment. The conclusions that can be drawn from the examination of *post-mortem* blood are not satisfactory in the differentiation of the varieties of parasites, for there is considerable change of the parasites in dead blood in all their forms except in the gametes and sporulates, as is indicated by the marked difference in the staining affinity of the parasites in the dead blood,

and the staining affinity of the same forms as seen in the living blood. In *post-mortem* blood the ring forms, instead of showing as faint rings of cytoplasm and a marked achromatic space, stain heavily blue, with little or no achromatic space, and often the chromatin nucleus is overshadowed by a brownish discoloration, which is probably pigment. The larger bodies are hyaline, and take the stain poorly, while their pigment is seen in little rodlets or granules. Moreover, the parasites seen in *post-mortem* blood, especially the nearly full grown forms, appear much smaller than similar ones in the blood before death. My conclusion then is, that there are only two varieties of parasites giving rise to the irregular fevers, and having gametes of crescentic form, and that both are *pigmented* in some of their stages of development. I shall for convenience, then, term these varieties, *Plasmodium falciparum subtertianum* and *P. falciparum quotidianum.*

The subtertian or malignant tertian parasite shows pigment early in its development. The pigment is coarse and granular, rather dark in colour, and the pigment nearly always remains more or less aggregated, and occupies usually an eccentric position in the cytoplasm. The parasite does not attain the full size of its erythrocytic host, and in many instances shrinks and distorts the red blood-cell to a quite considerable degree, "brassy bodies." The so-called non-pigmented parasite shows pigment late in its development. The pigment is in small granules, brownish in colour, and is usually disseminated throughout the cytoplasm until just before sporulation occurs, when it becomes aggregated about the centre of the organism. The parasite attains nearly or quite the full size of its erythrocytic host.

The characteristic fevers that these two varieties give rise to, and the many irregular or intermediate types of fevers these parasites may give rise to in the presence of multiple generations, are sufficiently described in all the text-books, and need not detain us here for a recapitulation. I shall then pass on, and take up briefly some of the salient features of the clinical symptoms of these forms of malarial fever. At the present time, with the prompt administration of quinine the attack of malaria is cut short so quickly that very little opportunity is offered to observe any of the special features of the symptoms. Therefore, the symptoms that can be noted are such as manifest themselves at the time the patient first presents himself for treatment, and such as may be elicited in the history taking. In cases of ordinary severity the patient usually states that he has been ill from one to two or three days. Headache is the most prominent symptom alluded to, then lumbar pain, weakness, especially in the knees, general muscular pains, and rather marked restlessness. Vomiting is nearly always present; if not spontaneous, it occurs as soon as medication is begun, the appetite is lost, and thirst is marked. Unless the patient is the subject of previous attacks of malaria, the spleen is not perceptibly enlarged, though pain in the splenic region is often noted. Jaundice is not often present in primary cases, but an icteric tint of the sclera is noted in secondary and third attacks. In the recurrent attacks and untreated attacks anæmia begins to appear as a prominent feature. In the grave cases the patient in most instances states that his illness has been of four, five, or six days' duration. The symptoms described for the milder cases are present in the grave cases, with increased intensity. Vomiting becomes a prominent and troublesome symptom. The spleen is now palpable, or its enlarged area can be noted by percussion dulness. Jaundice is present in some degree, but at times is obscured by the injected conjunctiva. Pain in the gall-bladder region is at times complained of. Another prominent symptom noted in the case history is vertigo. The patient will state, if English, that he is troubled with "a giddiness in the head," if French, "*étourdissement;*" and both are insistent that one takes notice of this symptom. Patients in this class of fevers will also state that while trying to perform their regular duties they were "struck down by the fever"—"*je tombe par le coup de fièvre.*" They sometimes lose consciousness, to regain it again in a short time. They are then brought to the hospital, and in those able to walk the gait is staggering or reeling, ataxic, and in every particular the gait resembles an ordinary alcoholic "drunk." When these patients are put to bed and quiet is obtained, they often drop off into a restless sleep, with muttering delirium, which may now and then arouse them from sleep with the sense that they have said something foolish or absurd. And at times, when aroused for medicine, they appear slightly lost or dazed. Jactitation is frequent in women, and convulsive seizures not uncommon in children. In other severer forms the patient, while up and about, and even trying to work, will suddenly fall in an unconscious state. He may not regain consciousness, or he may at the end of the paroxysm clear up mentally to a certain extent, and when treatment is not efficacious, to relapse again with the next succeeding paroxysm into a state of deep coma, or active delirium. In other severe infections the patient may have had one, or two or three, *initial* attacks, with intervening periods of fair comfort, to be seized at last by an attack in which the first warning of perniciousness is that when the patient is noticed by his friends, he is already in coma. In the most grave pernicious fevers a history is not easily obtained. Such as can be obtained will usually disclose the fact that the patient has been the subject of one or more previous attacks of fever; that in his present illness he has been sick a week or more, but most of the time up and trying to work if he happens to be a labourer. Patients with such a history may walk into the wards in the intervals between paroxysms, and aid in putting themselves to bed. As the time for the next succeeding paroxysm comes on active pernicious symptoms become manifest. As the fever mounts upward, most frequently it will be noted that the patient is becoming quieter, it is difficult to arouse him, he soon sinks into a deep coma, and death may end the scene in the next six to twelve hours. In other instances, at the beginning of the next succeeding paroxysm, active delirium

supervenes. Sometimes the patient is so maniacal that forceful restraint is necessary. If in these cases recovery does not take place, the patient later sinks into a deep coma, and thus ends the scene. When such an untoward event occurs, death may take place on the upward rise of the temperature, or at its fastigium, or on the downward slope, or, finally, as the temperature reaches normal. In some fatal cases death may be delayed to the third, or fourth, or even the fifth day. These cases will be described later.

It has never been my experience to see pernicious symptoms arise in malarial fever during active treatment, without some evidence of perniciousness having already manifested itself. Sometimes these premonitory signs are easily overlooked. It must be noted that in the grave malarias the patient may still appear perfectly conscious, and if questioned in such a way as to require direct answers, the answers are quite satisfactory. But if questions are put so that the answers will require a compound sentence, or an effort of memory, it will be found that the patient will wander off into vague and confused ideas, and leave the answer incomplete. Or, again, he answers in a morose way, or is entirely indifferent about it. When put to bed, he is usually quiet, but sometimes makes half-hearted attempts to sit up in bed, or attempts to get out of bed, and will have no reason to offer for doing so.

I have already stated that the fever curve is variable, and loses all semblance to its normal characteristics, but, curiously enough, in the grave and in the pernicious fevers the fever curve shows the greatest tendency to remain true to type. The temperature does not always rise to a height proportionate to the gravity of the infection. Thus, a pernicious case may have a temperature not above 100° F. The maximum temperature is usually 102° or 103° F., but at times it rises very much higher. The tongue shows nothing characteristic. In the severer cases the tongue is heavily coated with a colour from greyish white to yellow, or even dark brown, and sometimes dry. It may be of normal width, or in other instances narrow, and pointed at the tip, and red at the edges as in typhoid fever.

In these grave and pernicious cases of malaria, an examination of the blood of the periphery will in most instances disclose parasites in such great quantities as to easily account for the gravity of the symptoms. The variety of parasites will also be a notable feature. They will be found to be one or the other of the two varieties of the *P. falciparum*. The parasites of either variety are all sometimes found to be at about the same stage of maturity. Or, again, they may be found representing every life phase of the organisms. Thus, we may in some cases see only young ring forms present in the smears, again half-grown ring forms, with an occasional sporulating form, to, as I have said, all the life phases, with leucocytes, both large mononuclears and polynuclears containing pigment, and engulfed parasites partially disintegrated. If death takes place in a few hours after the examination of the peripheral blood, the same forms will be seen blocking the capillaries of the cerebral and cerebellar substance. The same will be observed in the splenic and bone marrow smears, with pigment scattered in abundance throughout the fields of the microscope.* There occur, however, occasional cases in which the examination of the peripheral blood discloses no such picture as just described. In these latter cases the number of parasites seen in the blood of the periphery will be no greater than the number seen in cases of ordinary severity. One will be surprised, then, on close examination of the patient to see him show signs of incoherence and bed restlessness, described under pernicious manifestations, and later break out into a delirium to end in coma and death. The autopsy smears in these cases will show the same blocking of capillaries, and great abundance of parasites in the internal organs, as noted above.

There remains to be described a form of pernicious fever in which the examination of the peripheral blood may not necessarily disclose a very great number of parasites, and during treatment the parasites rapidly decrease in the circulation; and yet the gravity of the symptoms continue to increase till death takes place on the fourth or fifth day after admission. At autopsy smears from the brain substance will show the capillaries patulous, and only a red blood cell here and there containing parasites. Smears from the spleen and bone marrow, and other organisms, are likewise scanty in parasites. The general autopsy findings are indefinite, and such as are found, macroscopically or microscopically, are insufficient as a rule to account for the cause of death. Marchiafava and Bignami [10] describe this form of pernicious malaria and remark that others have also seen them. They admit themselves unable to give a satisfactory reason for the cause of death. These authors note several hypotheses that have been offered as an explanation for these cases, among which the most important is a special toxicity of parasites. They do not accept this hypothesis, and neither do I. It is not clear to me how a special toxicity, or the usual toxins for that matter, can continue to increase in the circulation while at the same time the agent causing the toxin is decreasing. James [11] has noted this class of cases also, and offers a hypothesis of retention of toxins. As a tentative hypothesis I think we can assume a retention of toxins by the faulty elimination of organs concerned in this process, particularly the kidneys. But the evidence I have at hand makes this hypothesis of doubtful value. I have notes on four of these cases, two of which died on the eighth and tenth days respectively after admission. Parasites disappeared from the circulation rapidly under treatment, and the temperature of one reached normal on

* For a long time in my work I had never seen a case of this latter description, and on that account was led to the postulate that parasites did not accumulate in the internal circulation, but remained everywhere in the circulation in proportion to the amount of the blood supply of a given organ. I have since had that conclusion rudely shaken, and take this opportunity to withdraw it.

the second day, and that of the other on the third day. The temperature then began to rise again, and continued upward till death. Blood cultures during life and at autopsy were sterile, the autopsy findings disclosed some pigment, but no parasites. The cause of death in these two cases was shown at autopsy to be acute nephritis. The remaining two died on the fifth day after admission. The autopsy smears from the cerebral and cerebellar substance showed the capillaries patulous, and here and there a red cell containing parasites. Smears from the other internal organs were also equally scanty in parasites. Malarial pigment was present in the splenic pulp and bone marrow. In one of these cases the kidneys showed macroscopically evidence of cloudy swelling. Sections of the kidneys from the same case did not show sufficient histological changes to account for death. In the other case the kidneys were large and swollen, cloudy swelling was apparent, but no sections were made.

A test of the renal functions by the Rowntree-Geraghty [23] method with phenolsulphonephthalein would no doubt shed much light on this class of cases.

Albuminuria in Malaria.—Albuminuria in malaria is quite a common feature, though it varies to some extent in different localities. In 200 cases analysed I found albuminuria present in 42 per cent. of all cases of malaria. In the pernicious cases albumin and casts of various kinds are quite a common feature, sufficiently so that in my first case of pernicious malaria the diagnosis was uræmic coma in spite of the presence of large numbers of parasites in the peripheral blood. Brem [12] has also noted that the urine of pernicious cases shows the presence of hæmoglobin. These he designates "pernicious malaria with hæmoglobinuria." Working with Brem's method of testing for hæmoglobin in the urine, the reaction occurred with such a degree of constancy in pernicious fevers that it led me to conclude this phenomenon may be expected in all grave pernicious fevers.

Authors are in the habit of classifying malarias according to some particular symptom which manifests itself most prominently during an attack. This is more especially true with reference to the pernicious fevers. Thus we have comatose, delirious, syncopal, apoplectic, ataxic, algid, dysenteric, and choleraic, &c., &c. The four first forms noted here are already sufficiently described under the head of symptoms of the grave and pernicious fevers, in which I have noted the ataxic gait, and the patient may fall down, while he is attempting to perform his regular duties, in a temporary unconscious state, or at other times in a more or less continuous unconscious state, either of which may terminate in coma or delirium. I think it may be said that these symptoms are so common in this class of fevers that they do not require any special classification, but may be considered under one general head of symptoms of the grave and pernicious fevers. A few of the remainder can be taken up seriatum.

The algid and choleraic have been extremely rare here. I have seen one case of the algid form in which recovery took place without any after rise of fever, and James reports he has had one case of the choleraic form. The clinical symptoms described for both the algid and the choleraic forms are so strikingly like some cases of heat-exhaustion that I have had the opportunity to observe, that it has occurred to me that there must be a co-existence of heat-exhaustion and a severe malarial infection to give rise to such a train of symptoms. In heat-exhaustion the most prominent symptoms are a small running pulse and cold, clammy skin, intense cramping in the bowels, with vomiting. The stools are frequent and watery, and flaked with mucus, to later become tinged with blood.

As I have stated, the algid and choleraic forms of malaria are extremely rare here, and heat-exhaustion is also rare. Moreover, in James's choleraic case the sectioning of the mucous membrane of the intestinal tract disclosed no evidence of an inflammatory nature, nor any evidence of a determination of parasites to the intestinal mucosa (Darling). It is true that Marchiafava and Bignami [13] report otherwise, but at the same time they explain that the so-called ardent fevers are the effect of sunstroke and co-existent malarial infection. I think it is just as reasonable to assume that heat-exhaustion and co-existent malarial infection would be necessary to present the symptoms of either type of the opposite picture—the algid and choleraic forms.

Dysenteric Forms.—A number of observers have held that there is a variety of dysentery caused directly from malarial infection, or "malarial dysentery," Manson [14] and Craig [15] maintaining this postulate, while Mannaberg [16] maintains that the dysentery is an accidental infection co-existent with a malarial infection.

Mannaberg's view, in the light of my experience, appears to me to be the correct one. I think it would strike one as logical, that where malaria is endemic and dysentery also endemic there might be something accidental between them when both diseases occur at once in the same individual; and that dysentery may be a contributing cause for an outbreak of latent malarial infection, or, on the other hand, an attack of malaria act as a contributing cause of dysentery by lowering the resistance. But for malaria to have any grounds as a cause of dysentery, dysentery should be present with a fair degree of constancy in malarial attacks, just as other symptoms of malaria occur, for instance, anæmia, or at least show some rise in seasonable incidence simultaneously with the rise of the malarial morbidity. This it does not do. Dysentery in Panama shows a slight seasonal incidence twice a year. First in May, "el Mayo" of the Spanish, and again a slight increase in December and January, though in the main dysentery is fairly constant throughout the whole year, while the rise in malarial morbidity begins in June, and continues throughout July, August, September, October, and November, to slowly decline by the mid-dry season in March. The argument that dysentery is of malarial origin because malarial parasites are sometimes found

in the discharged blood from the intestinal mucosa, I do not think is of any value, because parasites would be found just as readily from any other hæmorrhagic source during a malarial infection. The so-called cure of these dysenteries by quinine, while the patient is at rest, seems to me to be only a tribute to quinine that it does not deserve, for the dysentery might have subsided just as readily on the rest and quiet without the quinine. I have tried ten consecutive cases of ordinary clinical dysentery without any medication, with rest and quiet, and had very satisfactory results.

Special Varieties of Malaria.—Special varieties of malaria and special complications of malaria, such, for instance, as malarial neuritis, reported from particular localities, towns, or villages; and malaria sufficiently characteristic to bear the name of particular places—one may be permitted to assume that these peculiar cases have not been investigated any further than the examination of the peripheral blood. And, putting it mildly, it is highly suggestive that some endemic or epidemic entity is confused with malaria, and is being overlooked. To divide malarial attacks into various forms according to the predominant symptoms is not of much service at the present, when we depend so largely on the microscope for the diagnosis. These divisions served a good purpose in the pre-parasitic days, as they warned the practitioner not to be too sparing in the use of cinchona bark, and later quinine, in the presence of symptoms that might simulate apoplexy or uræmic coma.

Differential Diagnosis.—I have already said that malaria, when properly treated, responds so promptly to quinine that one has but little opportunity to study its symptoms. Those that one can observe in the acuter cases will be found to be so similar to a number of other diseases, that to undertake to set them off in contrast will not be of much value in differential diagnosis. Some of the most characteristic manifestations of malaria are periodicity in the on-coming of its paroxysms, with more or less rigor or chilliness, attended by a rise of temperature, then a decline in temperature, with sweating. Thus, in the quotidian fevers these phenomena occur within approximately a period of forty-eight hours, or rather the paroxysms hold through or delay during a period of twenty-four or even forty-two hours, and then remission or slight intermission takes place. These characteristics, however, are not constant, and the fever, as already noted, often becomes an extremely irregular one. All of these same phenomena may be present to some degree in numerous other diseases. For instance, tuberculosis; suppurating diseases, such as liver abscess; general septic conditions, and in the later stages of long-duration typhoid fevers. The more chronic cases—I mean here the indifferently treated or untreated cases—will show symptoms fairly characteristic and of some diagnostic value. The most marked of these symptoms are a peculiar colour of the skin, melanæmia, jaundice of the sclerotics, and enlargement of the spleen. All of these features may be present before active paroxysms manifest themselves, and hold throughout an attack until treatment puts a partial end to them. There is one characteristic in the acuter malarias that may be of considerable value in differential diagnosis, and that is the bodily distress and pain which so quickly subside with the intermission or remission of temperature, and this takes place whether the intermission or remission is spontaneous, or brought about by the administration of quinine. The nature of this paper hardly requires a restatement of all the methods that may be made use of in the differential diagnosis, or the particular diseases one must differentiate from malaria. I am only trying to bring out what appears to be the most salient features. After the few symptoms that may be depended on for diagnosis comes the quinine test. And I regard this as the final test. I showed in a previous paper that all are agreed that the majority of malarial cases are readily controlled by quinine. I think I showed that I had eliminated one or two of the most troublesome diseases to differentiate from malaria, namely, uncinarial anæmia and typhoid fever, and how these may be eliminated; and that other workers in India had eliminated another, kala azar. With these problems out of the way, one can by various methods eliminate others, until we may return to the first principles laid down by Marchiafava and Bignami [17], that when the specific remedy is properly administered, malaria terminates its course in five or six days, or a week at most. By pushing quinine a little more vigorously than they did, we have been able in Panama to cause malaria to terminate its course a little more quickly than they were able to do in Italy. That is, under increasing dosage to meet the requirements of an increased infection we are able to cause malaria to terminate its course in two, three, four, five, or six days at most, with the temperature of the fifth or sixth day so slight as to be insignificant with regard to the differential diagnosis.

I have also said in a previous paper that malarial infection may complicate any other disease. To name the diseases in which malaria may complicate, it would be necessary to name practically every malady that can occur in a malarious country. Malaria, while it does complicate other maladies in numerous instances, varies in this respect quite considerably, and probably varies in different localities. It may vary in this respect between 1 and 20 per cent. Hence, with this point in view, one cannot consider one's duty finished by merely examining the blood and finding malarial parasites. Other diseases must still be considered. And any symptom which points to any other disease must be carefully weighed, and worked out. Some of these will strain our diagnostic skill to the utmost, and even exhaust our laboratory facilities. While this is true as to the undetermined diseases one may be contending with, I do not think it holds good as to the elimination of malaria. As I have said, the elimination of malaria may be readily accomplished by quinine.

Therefore, I may again state the axiom. A fever that continues for more than five days unchecked by quinine is not malarial fever. I make it a rule,

however, to consider malaria out of the case if the fever is uninterrupted by quinine to the morning of the third day. I also make it a rule to consider malaria out of the case if the fever is once completely controlled by quinine, and a second later rise of temperature occurs without any decrease of dosage or change in the patient's regimen. I have notes of one case which I think will illustrate my whole method of dealing with malaria, and the methods by which I have been led up to the conclusions that are responsible for this series of papers. One morning on rounds I had just stated the two above rules to my associates, when I was confronted by a chart of a patient in whose blood malarial parasites had been found, in which the fever had obeyed the first rule, but not the second. Three quarters of an hour of diligent search was taken to ascertain the cause of the second rise of fever. I had about abandoned the case in despair, and hoped to turn to the laboratory for the solution, when another examination over the heart area revealed a faint friction scratch at the left margin of the sternum in the fourth interspace. The scratch was now heard, now lost, with each rise and fall in the chest's movement in respiration. Pericarditis then was clearly the cause of the second rise of the fever.

In this case two conclusions were open to me. The first one was, that I had to do with a malarial infection resistant to quinine, and simply left off any further examination, and permitted the case to pursue its course. And I might have followed this reasoning until the pericardial symptoms became so obvious that they could not be overlooked—which they did do in four or five days. Or, when the pericardial symptoms could be no longer overlooked, consider the case then malarial pericarditis. As I had never seen pericarditis in malaria in 10,000 to 11,000 cases, either clinically or at autopsy, I did neither the one nor the other. But as pericarditis occurs frequently in tubercular conditions, I turned then to tuberculosis for the solution, and was rewarded by a positive tuberculin reaction, both Calmette's ocular test and Von Pirquet's skin test. These two tests are not held in such high esteem now as they were then, but they are of far greater value than the presence of malarial parasites in the peripheral blood three days previous to the pericardial scratch, and especially when a pericarditis had never occurred before in 10,000 cases.

It remains to consider the malarial cases in which it is necessary to depend solely on a few clinical symptoms, and the quinine test for diagnosis, that is, in acute infections with not a sufficient number of parasites yet in the blood of the periphery to be detected microscopically by ordinary routine blood work. The question as to whether parasites can always be detected in the peripheral blood if the number be sufficient to cause paroxysms and fever, has been discussed at length. Mannaberg [18] held that there are acute cases in which fever and paroxysms are present, and yet the parasites in the peripheral blood are not in sufficient numbers to be detected by ordinary blood-smear work. Thayer [19] admitted this, but considered such cases rare. Marchiafava and Bignami [20] state that by repeated and careful examinations the parasites can always be detected in the blood of the periphery if the numbers present are sufficient to cause paroxysms and fever. Ross [21], in order to simplify and quicken the examination process, devised a method which he calls the "thick film" method, with which he is able to detect parasites in the blood of the periphery in almost every case with fever and paroxysms. James [22], working with Ross's method, was able to find parasites in 94 per cent. of clinical cases of malaria. Ross's method, however, requires considerable skill in determining just what are parasites and what are artefacts, and on this account most men will rest content with ordinary blood films.

Therefore under the methods of examination as ordinarily carried out there will occur quite a number of acute malarias which will fall under Mannaberg's distinction; and hence the final diagnosis will depend on a few clinical symptoms and the quinine test. This being true, the question arises, What are we to expect of the clinical course and duration of these "negative" malarias? If the infection is too small to admit of parasites free in the general circulation to a number sufficient to be detected by ordinary smears, one would be inclined to infer that such an infection would give rise to mild symptoms which would respond readily to treatment. My experience is in accord with this inference. It is true that primary infections are sometimes a little stubborn, but not sufficiently so for one to admit that one of these mild fevers should continue uncontrolled by treatment for four, or five, or six days. I may say I have never seen a case of uncomplicated malaria in which the symptoms were at all severe, where I have been unable to find from at least a few ring forms up to, of course, almost the whole life cycle of parasites in the blood of the periphery. The infection being less, one should expect these "negative" malarias to respond to quinine even more promptly than the positive ones do, and the time allowed them to terminate their course should rarely be more than one to three days. In depending on the quinine test for diagnosis in the "negative" malarias, one should remember that all ephemeral fevers which may subside under quinine treatment are not necessarily malaria, and that many ephemeral fevers might just as well have pursued a similar course without quinine as with quinine.

[I wish to thank Colonel W. C. Gorgas, Chief Sanitary Officer, Isthmian Canal Commission, for permission to publish this paper, and also Dr. C. C. Bass, for his kindness in reviewing my description of the quotidian parasites.]

BIBLIOGRAPHY.

[1] THAYER, WM. S. "Lectures on the Malarial Fevers, 1897.

[2] MARCHIAFAVA and BIGNAMI. "Malarial Fevers," *Twentieth Century Practice of Medicine*, vol. xix, 1902.

[3] MANNABERG, J. "Malarial Fever," "Encyclopedia of Medicine," 1905.

[4] CRAIG, CHAS. F. "The Malarial Fevers," 1909.

[5] MANSON, Sir P. "Manual of Tropical Diseases," Fourth edition, 1909.
[6] JAMES, W. M. "Quartan Malaria and its Parasite," *Proceedings of the Canal Zone Medical Association*, April to September, 1910.
[7] BASS, C. C. *Proceedings of the Canal Zone Medical Association*, Seventy-sixth Meeting, July 10. 1912.
[8] CRAIG, CHAS, F. "Studies in the Morphology of Malarial Plasmodia after the Administration of Quinine and in Intracorpuscular Conjugation," *Journal Infectious Diseases*, vol. vii, No. 2, March 1, 1910.
[9] MARCHIAFAVA and BIGNAMI. "Malarial Fevers," *Twentieth Century Practice of Medicine*, vol. xix, 1902.
[10] *Idem.*
[11] JAMES, W. M. "A Preliminary Report on a Method for Preventing the Development of Pernicious Malaria," *Proceedings of the Canal Zone Medical Association*, 1911.
[12] BREM, WALTER V. *Archives of Internal Medicine*, February 15, 1912.
[13] MARCHIAFAVA and BIGNAMI. "Malarial Fever," *Twentieth Century Practice of Medicine*, vol. xix, 1902.
[14] MANSON, Sir P. "Manual of Tropical Diseases," Fourth edition, 1909.
[15] CRAIG, CHAS. F. "The Malarial Fevers," 1909.
[16] MANNABERG, J. "Malarial Fevers," "Encyclopœdia of Medicine," 1905.
[17] *Loc. cit.*
[18] MANNABERG, J. "Malarial Fevers," "Encyclopœdia of Medicine," 1905.
[19] THAYER, WM. S. "Lectures on the Malarial Fevers," 1897.
[20] MARCHIAFAVA and BIGNAMI. "Malarial Fever," *Twentieth Century Practice of Medicine*, vol. xix, 1902.
[21] ROSS, Sir RONALD. "The Thick Film Process for the Detection of Organisms in the Blood," "Thompson Yates Reports," V, Part 1.
[22] JAMES, W. M. "The Practical Value of the Ross Thick Film Method in the Diagnosis of Malaria," *Southern Medical Journal*, vol. iii, No. 11, December, 1910.
[23] ROWNTREE and GERAGHTY. *Archives of Internal Medicine*, 1912, vol. ix, p. 284.

"Bulletin of Entomological Research," vol. iv, Part 1, pp. 1-93, May, 1913.

Varieties of Glossina morsitans.—Shircore believes there are two varieties of *G. morsitans* in Nyasaland. He suggests the names *G. morsitans* var. *pallida* and *G. morsitans* var. *paradoxa*. The *pallida* is distinctly paler throughout than the ordinary morsitans; *paradoxa* superficially resembles it (the ordinary morsitans) in appearance and size, but the hind tarsi are entirely dark, as in the palpalis group. The superior claspers of the male genitalia resemble those of *G. submorsitans*, but are more deeply pigmented throughout, and especially along the lateral and posterior borders. Shircore believes that if *paradoxa* were casually observed, it would probably be taken for an ordinary *G. morsitans*, but if the abdomen had become discoloured it might be mistaken for *G. palpalis*.

"Bulletin of Entomological Research," vol. iv, Part 1, pp 1-93, May, 1913.

Glossina in Northern Nigeria.—Macfie furnishes an interesting study of the distribution of *Glossina* in the Ilorin Province of Northern Nigeria. Talking of the question of the big game as reservoirs of trypanosomiasis he says it should undoubtedly be determined what forms of trypanosome they harbour in Northern Nigeria; but before undertaking extensive measures to drive back the game from the inhabited areas some experiment on a large scale should be carried out on the lines suggested by Dr. Yorke. It is perhaps unnecessary to insist that, in view of the discoveries of Kinghorn and Yorke in Rhodesia, the destruction of big game in the vicinity of native towns and European stations should be encouraged instead of being artificially restricted.

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CASTELLANI AND CHALMERS'S "MANUAL OF TROPICAL MEDICINE."

THE second edition of this manual is more than the mere fresh issue of a book consequent upon the exhaustion of a previous volume. No one who has even casually looked through the recently issued copy can but be struck by the vast accumulation of material compressed within the 1,747 pages of which the volume is composed. The appearance of the work gives food for reflection in many directions, and perhaps in none more so than in the fact that within a couple of decades a new department of medical literature has been created and developed to an extent and degree to which this book bears ample testimony. Until Manson wrote his great pioneer book on Tropical Medicine we had no literature founded on a scientific basis to guide or instruct us in this branch of study. Previous volumes, not wanting in bulk, told us of Diseases of the Tropics, but they were mere descriptions of the signs and symptoms of ill-defined ailments combined with recommendations of drugs and schemes of treatment empirical in their choice and application. Not that these volumes were not pregnant with valuable information; we make a mistake if, in our haste to redeem past ignorance, we neglect to know and to appreciate what has been done previously. Castellani and Chalmers have not made that mistake; in their all too short history of Tropical Medicine they tell us of ancient practices in the fight against disease; these are not presented to us in a manner calculated to provoke derision or ridicule; but instead the Jewish, Indian, or Egyptian rites and customs are analysed so that the seeds of truth are sifted from amongst the chaff of ritual, and due respect paid to the kernel. Another feature of the manual is the encyclopædic character of the information it affords. It is but yesterday that we looked upon the elucidation of the malarial problem as if it were the "be

all and end all" of knowledge necessary for a generation to come; but we find that this was but the spark needed to set alight the torch and illuminate a world of science. It served to set free the pent-up, unsatisfied longings of men who, peeping from behind the curtain of ignorance, had guessed at truth, and has given vent to a torrent of knowledge such as no department of science has equalled in so short a space of time. From the days when Ross was dealing with the "tiger" mosquito to the present time would seem to indicate an epoch in knowledge, yet it is but some fifteen years since, as medical men, we were ignorant of even the rudiments of entomology, and knew not the names of even the commoner families of insects around us. Nor can we lay this ignorance at the doors of medical men only, for the naturalists amongst us had but skirted the confines of the subject which lay enshrouded in dense folds of ignorance. Entomology has grown, from being a frivolous or at best an academic study, at the behest of the doctors to be a practical science, and the stir occasioned by the doctors' demands in the realm of entomology and biology generally is not the least of the triumphs the advance in Tropical Medicine has occasioned. The practical necessities of medical research anticipated and demanded activity amongst biologists, and it is satisfactory to know that the latter have risen to the occasion, and led by the scientific staff of the British Museum, Blanchard, of Paris, and others, they have supplied the information demanded.

Whilst congratulating all who have thus added to our information and brought light to bear upon obscure problems, we must also think of the effect of this accumulated knowledge upon the student of medicine. Until Manson's book appeared, the medical man about to take up practice in a tropical country had no real guide on which to rely as a help in the new field of practice he was about to enter. He picked up his knowledge as best he could, often with bitter regrets on his part in consequence of his ignorance to check disease or save life.

For this ignorance he has no longer excuse; far other is the case, for he is now confronted with a plethoric storehouse of new matter to study, which may well appal the half-hearted student. A glimpse at Castellani and Chalmers's book shows a range of subjects new to ordinary medical study, for in no published book in any department of medicine, from ancient times until the present moment, has there been collated in any one volume a range of subjects so apparently diverse, yet so closely knit in necessary union. To merely enumerate the headings bears out the truth of this statement. A knowledge of climatology, ethnology, bacteriology, helminthology, parasitology, entomology, in addition to special pathology and clinical work, are necessary requirements of the medical man intending to take up the practice of medicine in the Tropics. In our tropical schools, in the all too short three or four months' course of instruction, practically all these subjects have to be learned; for in our Universities and Colleges the knowledge acquired of the various subjects mentioned is but of little practical value; and the necessity for thorough practical instruction in at least the rudiments of Tropical Medicine is abundantly apparent when one considers the nature of the character of the work required of medical men whose life's work lies in a tropical country.

The diagnosis of the diseases met with necessitates an intimate and exact knowledge of the ordinary laboratory methods; for, except in the large cities, there is no laboratory expert to send specimens to for diagnosis or investigation. To even cursorily look through Castellani and Chalmers's encyclopædia of information, one unacquainted with these facts would gather the impression that we expect our young men to be all-round experts before proceeding abroad. In a sense this is true, but only in a limited sense; what is demanded is that they should be thoroughly grounded in their work, so that they may be capable of treating their patients on a rational basis, and not along the empirical lines in vogue until recent years. After all, it must be remembered that the treatment of disease is the sole object of all the elaborate training insisted upon. It is not to make experts in entomology, helminthology, or parasitology that is the object of teaching, but to produce intelligent practitioners in the first instance.

In every line of Castellani and Chalmers's great work this fact is never lost sight of; the application of scientific methods to clinical work and observation is the watchword of their teaching, and excellently and consistently they have executed their task.

A detailed review of a work of the kind is out of the question, nor is it called for. We are not dealing with personal opinions, but with a compendium to date of the world's knowledge of Tropical Medicine and the sciences with which it is directly allied. Diverse opinions and observations are given due prominence, and yet the subject matter bears, as it should, the stamp of the authors' trend of thought, and conveys their well-considered judgments and opinions on many debatable points. Time will no doubt serve to alter many of the recorded statements set forth; this is in accordance with the advance of science in every direction, and cannot be ascribed to the faults of authors, but to the hiatuses in our present-day knowledge.

The volume before us has no superior in any branch of medical literature; thorough, practical, and scientific, it stands as a monument to the authors, and credit to the medical literature of 1913.

J. C.

"Annals of Tropical Medicine and Parasitology," June 10, 1913, vol. vii, No. 2.

Age and Sex in Trypanosomiasis.—Todd has studied this subject in Africans suffering from trypanosomiasis. He arrives at the following conclusions: (1) The proportion of elderly individuals among them is lower than it is among Europeans. (2) By far the majority of cases of trypanosomiasis are persons of middle age; almost none of them are elderly persons. (3) The percentage of individuals with a considerable degree of glandular enlargement—which is coincident with trypanosomiasis—is very much greater in adults, and in children, than in elderly persons. (4) It is possible that the low incidence of trypanosomiasis among elderly persons may be due, in part at least, to an immunity acquired by them.

Annotations.

The Treatment of Balantidial Infections.—The "Quantitative determination of the balantidicidal activity of certain drugs and chemicals as a basis for the treatment of infections with *Balantidium coli*" is the title of a paper by E. L. Walker in the *Philippine Journal of Science, B Tropical Medicine* (vol. viii, February, 1913, No. 1). The work was done at the Biological Laboratory, Bureau of Science, Manila, P.I. Dysenteric conditions due to the *Balantidium coli* have frequently been reported from the Philippine Islands and other parts of the world now, so it is important to determine what are the best drugs to treat these conditions with. Walker's work will help in this respect. His conclusions are as follows:—

(1) The compounds of arsenic and antimony, the aniline dyes, quinine, ipecacuanha and its alkaloid emetine, substances which are employed more or less successfully in the treatment of other protozoan diseases, possess little or no balantidicidal value.

(2) The salts of the heavy metals, especially mercury and silver, have been found to be eminently balantidicidal.

(3) It is possible that some of the inorganic salts of mercury or silver, administered by the mouth, or by subcutaneous or intravenous injection, might be efficient in the treatment of balantidiasis. The salts of mercury are successfully employed in the treatment of certain spirochæte infections, and when given internally are eliminated in part by the mucosa of the large intestine; consequently, the mercury would be brought in direct contact with the infected tissues in balantidiasis.

(4) The application of these inorganic salts of mercury and silver to the local treatment of balantidiasis is rendered impracticable by the facts that they are precipitated by albumin, and consequently possess little power of penetrating the tissues, and that they are relatively toxic for man.

(5) The organic compounds of silver are not precipitated by albumin or, if precipitated, form soluble compounds that should be capable of penetrating the tissues, and they are relatively non-toxic for man.

(6) Quantitative tests have demonstrated that certain of these organic compounds of silver possess a balantidicidal activity as great, in proportion to the amount of silver contained, as silver nitrate.

(7) The practical value of these organic compounds of silver in the treatment of balantidiasis can be determined only through clinical experience.

Budding in Entamœbæ.—Darling, in the *Archives of Internal Medicine* (vol. ii, No. 5, May 15, 1913), contributes a paper on "Budding and other forms in trophozoites of *Entamœba tetragena*." These, he states, simulate the "spore cyst" forms attributed to *E. histolytica*. He believes that Schaudinn's interpretations were wrong in so far as they referred to a mode of development. Darling's observations on his stained specimens lead him to the conclusions that as regards the trophozoites of *E. tetragena* chromidia is not given off by the nucleus, but is formed in the cytoplasm. Chromatin, however, in these pathological forms does diffuse out in fluid form from the nucleus into the cytoplasm. The nucleus does degenerate and is extruded. In some trophozoites chromidia was present in rather small particles and collected in reticular masses in the ectoplasm, as Schaudinn described. Ectoplasma buds filled with a chromidial mass were seen apparently pinched off of the parent body. The free globules, while detected with more difficulty in wet-fixed preparations, were seen very well in dry-fixed Romanowsky preparations. Nothing like a sheath was seen, for the buds stained either navy blue or light blue like the cytoplasm of the parent entamœba. When an extruded nucleus was encountered it always stained like one.

In fresh preparations of *E. tetragena* from a fatal case of dysentery Darling has seen bizarre pseudopodia and buds with refractile bodies in the extremities, though extrusion of buds or nuclei was not observed. If one had merely observed in fresh preparations alone from a case of dysentery in man, the changes corresponding to those seen in stained preparations, the impression received would no doubt have been very much like that described by Schaudinn and Craig as the spore cyst formation of *E. histolytica;* but from an examination of the far more richly infected material from the kitten "which occurs after a lengthy period of lively increase," the true nature of the budding forms is understood and the opinion is formed that these changes are analogous to such essentially pathological manifestations of cellular degeneration as karyolysis, karyorrhexis, pyknosis and dislocation and extrusion of nuclei; moreover, the budding process is analogous to changes seen in mononuclear metazoal cells; for example, in defunct plasma cells or lymphocytes in the blood-stream, lymph-nodes and other locations.

The descriptions of the life cycle of *E. histolytica* by Schaudinn and Craig, therefore, are in all likelihood those of a spurious species, having resulted from observations of pathological changes in senile races of *E. tetragena*.

Sleeping Sickness in South Africa.—The final report of the Luangwa Sleeping Sickness Commission of the British South Africa Company, 1911-1912, appears in the *Annals of Tropical Medicine and Parasitology* of June 10, 1913 (Series T. M., vol. vii, No. 2). It is written by Kinghorn, Yorke and Lloyd, the latter being the entomologist to the Commission. The work is divided under six sections, namely: (1) The human trypanosome; (2) trypanosomes of game and domestic stock; (3) trypanosomes found in wild *Glossina morsitans;* (4) description of trypanosomes; (5) development of *Trypanosoma rhodesiense* in *Glossina morsitans;*

and (6) report of entomologist. There is also an introduction and two appendices. A very large amount of work is covered in the report, and many very important observations and researches generally are incorporated in its pages. As regards the presence of trypanosomes in game and domestic stock, the author's summary is that trypanosomes are of frequent occurrence in game and domestic stock in North Eastern Rhodesia. As a conservative estimate the percentage of big game infected with trypanosomes pathogenic to man and domestic stock may at Nawalia (Luangwa Valley) be placed at 50, and at Ngoa (Congo-Zambesi watershed) at 35.

At Nawalia six species of trypanosomes were isolated from game and domestic stock, *viz.*, *T. rhodesiense*, *T. vivax*, *T. nanum*, *T. pecorum*, *T. montgomeryi*, and *T. multiforme;* whilst at Ngoa five species were found, *viz.*, *T. rhodesiense*, *T. vivax*, *T. nanum*, *T. pecorum*, and *T. tragelaphi*.

The results of examination of over 400 monkeys, wild rats and mice were invariably negative.

Three species of trypanosomes were isolated from wild *G. morsitans*, namely, *T. rhodesiense*, *T. pecorum*, and a third, hitherto undescribed parasite, for which the authors propose the name *T. ignotum*.

These could easily be obtained by feeding wild, freshly-caught *G. morsitans* on healthy monkeys.

Dealing with the development of *T. rhodesiense* in *G. morsitans*, the authors say that:—

(1) The salivary glands of all *G. morsitans* capable of transmitting *T. rhodesiense* are infected, and conversely without invasion of the salivary glands there is no infectivity of the fly.

(2) Invasion of the salivary glands is secondary to that of the intestine.

(3) The first portion of the developmental cycle of the trypanosome takes place in the gut. In order for its completion and for invasion of the salivary glands to occur, a relatively high mean temperature, 75° to 85° F., is necessary.

(4) Invasion of the salivary glands was only found in flies infected with the human trypanosome, *T. rhodesiense*.

(5) The predominant type of the trypanosome in the intestine of infected *G. morsitans*—a large broad form—is quite different from that which predominates in the salivary glands, where the parasite resembles somewhat the short form seen in the blood of the vertebrate host.

(6) Both the intestinal forms and also those from the salivary glands of infective *G. morsitans* are virulent when inoculated into healthy animals.

In the entomologist's part of the report a record of blood-sucking insects and ticks collected in the Luangwa Valley from August, 1911, to March, 1912, and at Ngoa from March to May, 1912, is given, while the appendices deal with: (1) An experiment to ascertain whether tabanids transmit trypanosomes in nature (Wallace and Lloyd); and (2) an attempt to transmit *T. rhodesiense* by means of *Ornithodoros moubata* (Wallace).

Trypanosoma brucei.—Stephens and Blacklock (*Annals of Tropical Medicine and Parasitology*, June 10, 1913; and *Proceedings of the Royal Society, B.* vol. lxxxvi) write on the non-identity of *T. brucei* (Plimmer and Bradford, 1899) with the trypanosome of the same name from the Uganda ox. In dealing with the subject they believe there are three possibilities:—

(1) That the strain they possess, which they have been designating *T. brucei*, Zululand, is not this strain at all, but some other trypanosome inoculated erroneously during the course of inoculations extending over years. They think this view is untenable, for it would not explain the monomorphic character of the old slides examined, nor would it explain Laveran's monomorphic trypanosome.

(2) While Bruce may have been working with a dimorphic trypanosome in Zululand, and still has slides showing these characters, it is quite possible that the strain sent by him to England was something quite different. This is all the more likely, as Bruce successfully infected dogs from a variety of wild game, *viz.*, wildebeeste, kudu, bush buck and buffalo, and, as Bruce himself states, "when *T. brucei* was discovered in Zululand in 1894, it was naturally thought to be the one and only trypanosome in Africa," and no suspicion arose at that time of a multiplicity of trypanosomes in native game.

This is the simplest explanation, and the fact that Plimmer and Bradford do not describe or figure stumpy forms, and the authors' examination of Dr. Plimmer's slides had the same result, makes it probable that this is the true one.

(3) That the strain originally sent to England was dimorphic, but that it has now become monomorphic. This may have come about in two ways:—

(*a*) The strain originally was a *mixture* of a long trypanosome and a stumpy trypanosome, and the stumpy has now died out. If this explanation were valid, it would probably imply that *T. gambiense* and other dimorphic trypanosomes were also mixtures. This the authors regard as a not impossible view, but one they cannot at present prove or disprove.

(*b*) The strain was originally *dimorphic* (but not a mixture), and that it has now become *monomorphic*. If this were so, it would modify materially our notions of specificity of trypanosomes, at least in laboratories. Of such a change there is at present not much evidence. The authors have noted, however, above that the Uganda strain kept in mice for a year was almost (but not entirely) monomorphic, but that in guinea-pigs it at once showed its normal characters.

It is impossible at present to decide between these explanations.

They come back, therefore, to the fact of which they have no doubt, *viz.*, that the trypanosome that Plimmer and Bradford worked with, and which they named *T. brucei* in 1899, is certainly now a monomorphic trypanosome, and is not the same as the trypanosome from the ox described

under the same name by Bruce and others in Uganda.

According to them, these facts brought forward prove the non-identity of the Zululand and Uganda strains.

In order to avoid confusion, they think it advisable that the Uganda trypanosome should be re-named, and propose for it the name *T. ugandæ.*

Treatment of Surra in Camels.—Leese reports successful experiments on the treatment of surra in the camel with recommendations for systematic treatment (*Memoirs of the Department of Agriculture in India*, April, 1913, Veterinary Series, vol. i, No. 3). Various lines of treatment are described, soamin, tartar emetic, asenious acid, sodium arsenate being the drugs employed. In some cases complete cure seemed to result.

When a treatment fails to cure, relapses usually occur between two and seven weeks, but one or two cases did not relapse until 88 or 89 days after the last dose. The camels therefore require some inspection during the three months following treatment, and should be kept within reach until then. The camelman should watch for and report any sign of fever, which should then lead to examination of the blood for trypanosomes. It is a good thing if the temperature can be taken daily so as to detect relapses.

Cases which relapse may be treated again with an excellent chance of cure, provided the camel is in a fit state to stand a second treatment. If the second treatment fails, a third can be applied; the author has had a cure on the third trial.

When a camel has relapsed and it is desired to treat it a second time, the record of the first treatment is a very good guide as to the scale of dosage that will be most suitable for the second treatment.

Emaciated camels cured by treatment take several months to get into working condition. After treatment, no camel should be worked for a minimum period of one month, and generally longer, according to the case.

Leese has only treated one cow-camel, but recommends at present the same way of estimating dosage as for males. Experience may show whether this is correct or not.

He has also no data as to dosage for camels under 4 years of age. The difference between the dosage which cures and that which kills is not big enough to justify fixing the doses by guesswork. It must be left to experience. The chances of spontaneous recovery are pretty good in *bachas* of 1 or 2 years of age in breeding-herds, as they are not required to work, and it would not always be a good plan in a breeding-herd to apply treatment to a *dachi* or *bacha* which had passed the acute stage of the disease, if segregation is possible.

During the treatment of surra the camels may be kept together in one herd provided they are not placed in it until trypanosomes have gone from the blood. In practice (as apart from experiment) microscopic examination of blood is only necessary for a few days, *viz.*, to find out when to give the first dose, and to note when the trypanosomes have dispersed (generally within twenty-four or forty-eight hours after the first dose).

Trypanosomes do not re-appear during treatment when the instructions given are carried out; it is unnecesary to burn the carcases of any camels which die from poisoning during treatment.

Camels cured of surra by drugs are not immune to second infections. One, for example, which, subsequent to treatment, had gone 498 days under daily blood-examination without relapse, and whose blood had also been found innocuous to a guinea-pig, was inoculated with 15 c.c. of blood, containing numerous trypanosomes, obtained direct from the jugular vein of a camel suffering from surra. A control inoculation was also made into a guinea-pig.

After an incubation period of four days, trypanosomes appeared in the blood of the camel and rapidly increased until on the third day they were swarming. The control guinea-pig also got the disease.

Tick-bite.—Eaton, in the *Australasian Medical Gazette* of April 26, 1913, describes a case of tick-bite which was followed by a widespread transitory muscular paralysis. The patient was a little girl aged 4½, and Eaton, after a description of the tick by the child's father, concluded that it must either have been *Ixodes ricinus* or *Ixodes holocyclus*. The tick, attached to the back of the right shoulder, was only found when the child was being put to bed unwell. Its body was cut off, leaving the head and mouth parts embedded in the skin. The same evening the patient vomited, and during the rest of the night was very restless and did not sleep much. The bowels moved twice, the motions being of a brown colour and semi-solid consistency. On the second day the child vomited three or four times, and it was then found that she could not stand and appeared very ill. She was sent to Dr. Eaton, who examined her in the afternoon; he found a state bordering on delirium, a temperature of 101.4° F., a pulse of 132, knee-jerks absent, and the muscles of the legs and thighs quite flaccid and motionless. Over the lower part of the right scapula there was a bright pink patch about the size of a penny, neither raised nor indurated, and in the centre of this was a purplish-black spot a quarter of an inch in diameter. In the middle of the spot was an aperture somewhat less than a pin's head in size, and through this a greenish-grey body, which grated with a stony hardness against the point of a knife, was visible. A minute droplet of pus was expressed from the aperture. The object felt with the knife, evidently the head and chitinous mouth-parts of the tick, could not be removed without breaking it into fragments. It was ultimately scraped out, and the cavity, about the size of an average match-head, was cleaned with a small curette, and cauterized with pure carbolic. Strychnine was given hypodermically.

On the third day the bowels moved nine times, the motions being liquid and bile-stained. The temperature had become normal, and though there

were still signs of irritability the mental state had cleared. There was still, however, no sign of return of voluntary movement to the legs, but the muscles were not so limp, and the strength of the arms was better. By the next day, the fourth since the onset of symptoms, the knee-jerks were both obtainable, but deficiently. The child could stand, and even walk a few steps with support. The pupils were still inactive to light, but reacted well to pilocarpine. Diarrhœa continued, but was less severe. On the fifth day the patient could walk without support, but the gait was knock-kneed, so that each leg was brought more directly under the weight of the body. In walking no attempt was made to rise on to the ball of the foot. The pupils now reacted to light, but were still somewhat dilated. The pulse rate was 96, and the temperature was normal. The bowels had moved twice since the preceding day. The discoloration around the bite-mark had become reduced to about the size of a shilling, and had faded to a duller red shade. The cavity had not yet filled up, but was healing well. This was the last time Dr. Eaton saw the patient, but he was informed that her progress to complete recovery within the next few days was uninterrupted.

Bites of ticks causing severe intoxication in the human subject, Eaton states, have been recorded in Australia several times, and one at least with a fatal issue. Lambs and dogs are not infrequently killed by them, and it would seem that in most cases the symptoms are chiefly muscular paralysis, affecting first the hind limbs, later the fore limbs, and leading to death by respiratory paralysis. Cleland, in the *Australasian Medical Gazette* of September 21, 1912, quotes Bancroft, who had observed many such cases in the lower animals. He mentions that symptoms commenced, as a rule, two or three days after the tick had attached itself; that unwillingness to take food and drink is usual; that the muscles most remote from the heart are those paralysed first and most severely, and that the heart suffers last of all. He also says that animals in infected country become immune to tick-bite.

Of the cases in the human subject, quoted by Cleland, the same uniformity of symptoms is not to be observed. In one, amblyopia was the most striking symptom, the pupillary movements were normal, and only slight muscular weakness was present. In another (an infant of 13 months), which proved fatal within two days, paralysis obtained in the legs and respiratory muscles. These symptoms appeared on the second day from attachment of the tick. In a third case, in which a man had 200 ticks removed from his body, faintness commenced within an hour of their attachment. There was no paralysis, but severe cardiac symptoms lasted for a week. These three cases bear little resemblance to each other, and it seems as if the symptoms must have been caused by different poisons.

The present case, that of the infant quoted, and those of the lower animals under Bancroft's observation, all closely resemble each other. In all, there was a period varying from one to several days after the attachment of the tick before muscular symptoms ensued. In the case described above the presence of fully-formed pus at the first examination indicated that the tick had been there at least 48 hours.

The most striking feature was, Eaton says, the severity of the intoxication, and the way in which the motor functions were selected by the toxine, the mental faculties only being moderately affected, and the sensory ones probably not at all. The absence of reflexes, taken in conjunction with the seeming integrity of the afferent paths, and also the complete loss of tone of the muscles, fix the site of motor interference either in the muscles themselves or in the lower motor neurone; that is, in the cerebrospinal nerves with the cells of the anterior horn and of the cranial nerve nuclei respectively. Suspension of the function of the cells centrally would account for most of the phenomena, but not for the grouping of the muscles affected nor for the behaviour of the pupil. The intensity of paralysis and the lateness of regaining function followed an order of remoteness, in the blood-stream, from the heart, while of groups closely associated in the central nervous system some were deeply affected, and others only lightly; as, for example, the glutei, on the one hand, and the muscles below the knee on the other, with their centres close together in the lower lumbar part of the cord, or the sphincter pupillæ and the extrinsic ocular muscles, with their centre in the third and closely adjacent fourth and sixth nuclei.

In general, the resemblance of the symptoms to those of conine poisoning is very close; an intense paralysis of the motor nerve end-plates, a particular picking out of the respiratory muscles due probably to an action on the centre in the medulla, a late and relatively slight interference with mentality, gastro-intestinal irritation, and so on; in fact Eaton thinks the only point of difference from a typical hemlock case was that the onset of symptoms was more prolonged.

As to the source of the poison, there are, Eaton thinks, three possibilities: its pre-formation by the tick, its development in the blood of the patient, if the poison were an infective one, or its elaboration chemically or biologically, at the situation of the bite, with subsequent absorption. There are many reasons, he thinks, for believing that it is not already formed in the glands of the tick. Bites of this kind must be exceedingly common, yet such symptoms are relatively rare. Again, in the cases quoted, the symptoms are very variable, although the ticks have probably all been of the same species, at any rate, all of the genus *Ixodes*. Were the bite itself venomous, one would expect a certain degree of constancy in the type of symptoms and a more frequent incidence of them, and it is improbable that the latent period would be nearly so long—sometimes several days. Increase of severity of symptoms after removing or killing the parasite would be improbable also; yet this usually occurs.

Notes and News.

BRITISH MEDICAL ASSOCIATION.

(Eighty-first Annual Meeting, Brighton, July 22, 23, 24, and 25, 1913.)

Section of Tropical Medicine.

President:

Lieut.-Col. Sir. Wm. Leishman, M.B., F.R.S., R.A.M.C., Rotherwood, Linden Gardens, Leatherhead.

Vice-Presidents:

Edward Irwin Scott, M.D., 28, St. Aubyn's, Hove; Professor William John Ritchie Simpson, C.M.G., M.D., F.R.C.P., 31, York Terrace, Regent's Park, N.W.; Major William Sandilands Harrison, R.A.M.C., Royal Army Medical College, Grosvenor Road, S.W.

May, 1913.

The Section of Tropical Medicine will meet on Wednesday, Thursday, and Friday, July 23, 24, and 25, 1913, from 10 a.m. to 1 p.m., under the Presidency of Lieut.-Col. Sir Wm. Leishman, M.B., F.R.S., R.A.M.C., when it is hoped that you will be present and take part in the work of the meeting.

The following subjects have been selected for discussion:—

Wednesday, July 23.—"The Causes of Invaliding in the Tropics." Dr. Basil Price will read a paper and open the discussion on this subject; Professor Simpson and others will take part.

Thursday, July 24.—"Dysentery." Captain Douglas will open the discussion.

Friday, July 25.—"Filariasis." Dr. G. C. Low will read a paper and open the proceedings.

It will greatly conduce to the success of the meeting if members will kindly notify as soon as possible whether they propose to take part in the discussions, or wish to make any communication to the Section.

Any such communication must not occupy in reading more than fifteen minutes (about 1,500 words), and, for profitable discussion, it should take the following form: (i) A definite statement of what it is intended to suggest, or prove; (ii) a statement of the facts or arguments on which such thesis rests; (iii) a very brief summary of the leading points.

Papers if not read form no part of the proceedings of the Section. If, however, you are unable to be present your paper will be read for you by one of the Secretaries.

Eliot Curwen, M.A., M.B., B.C.,
1, St. Aubyn's, Hove;
Francis William O'Connor, M.R.C.S.,
London School of Tropical Medicine,
Royal Albert Dock, E.,
Hon. Secs.

LIVINGSTONE COLLEGE.

The Commemoration Day proceedings at Livingstone College, on Saturday, June 7, gave the opportunity for the celebration by the College of the Centenary of David Livingstone, after whom the College is named. The Principal, Dr. Harford, pointed out in his opening statement that Livingstone College had been associated with many of the united meetings and services in connection with the Centenary, and that on the occasion of the National Memorial Service in St. Paul's Cathedral, at the suggestion of the Dean, after consultation with the Missionary Committee which organized the service, it was decided that the collection after expenses were paid should be given to the Livingstone College: a gratifying tribute to the fact that the College is a memorial to the great Pioneer Missionary of a truly representative character.

Dr. Harford further stated that very few of the speakers at recent meetings had recognized the relation between Livingstone's medical training and the great contributions which he made to the knowledge of the African Continent. It was felt to be most appropriate that this should be emphasized at Livingstone College, where Missionaries receive elementary medical training in order to fit them to go forth as missionary pioneers. A large number of old students had gone forth to Central Africa to follow in the footsteps of Livingstone, whilst some were to be found in almost every part of the world, but in every case they could carry with them the spirit of Livingstone shown by keen powers of observation, large-hearted sympathy, and a readiness to co-operate with other Christian missionaries.

An illustrated souvenir of the Livingstone Centenary, containing coloured reproductions of the portraits in the possession of the College, had been issued, and copies had been graciously accepted by their Majesties the King and Queen, H.R.H. the Prince of Wales, and her Majesty Queen Alexandra. These souvenirs, as well as postcards, were on sale for the Livingstone Centenary Fund. It was desired to raise a fund of £10,000; £3,500 to clear off a mortgage on the property, £1,000 to effect further improvements, and £5,000 to form the nucleus of an endowment.

A valuable piece of land had been presented to the College by Mr. Robert Barclay, and £490 had been received towards the Centenary Fund. The Rev. W. D. Armstrong, an old student of the College, from the Congo, where he had proved the practical benefit of the training, was endeavouring to create interest in the fund. Contributions might be sent to him at Livingstone College, Leyton, E., or to the Principal.

After Dr. Harford's statement, Bishop Montgomery, who presided, warmly commended the College, and referred to the great benefit which had been received by the missionaries of the S.P.G. from its training.

Sir Alfred Pearce Gould pointed out the careful distinction which should be made between medical missionaries, who must have a full qualification

and students who received elementary medical training; yet the latter was of vital importance, particularly in order that the missionary should safeguard his own health. He would like every missionary to have nine months at the College before going abroad, and he would advise missionaries on furlough to undergo the training.

The Rev. J. du Plessis, Secretary of the Missions of the Dutch Reformed Church in South Africa, now a student at the College, paid an eloquent testimony to the advantages of the College as a centre for Christian union.

The Rev. W. D. Armstrong, as an old student, stated that by the training received he believed that he had been enabled to save his own life and that of his wife in dangerous illness, as well as fellow missionaries, traders, and other Europeans.

Monsieur Lenoir, Secretary of the Mission Romande of Switzerland, who had taken a special journey to England for the purpose, expressed the congratulations of his society.

A representative gathering of friends and others interested in missions was present, tea being served after the meeting in the grounds of the College.

Typhus Fever in China.—We regret to record the deaths from typhus fever of several well-known men in China: Dr. Hart, of Wuhu; Dr. G. F. Jenkins, of Taoyuan; Dr. Robertson, of Hunan; Professor Luther Knight, of the Chinese University of Chengtu.

Flandin and Joltrain (Report of the Société Médicale des Hôpitaux, *La Presse Médicale de Paris*, April 16, 1913, p. 309), having noted the beneficial effect of emetine on subduing hæmorrhage in amœbic dysentery, tried this drug on a case of tubercular hæmoptysis. The patient was a man with profuse hæmoptysis, which had resisted all the usual remedies. After an injection of 0·04 C. of emetine hydrochloride the bleeding stopped abruptly. This may, of course, only have been a coincidence, but further observations with this drug might be made.

Drugs and Appliances.

A new wine food, "Winox," for which special features of quality and purity are claimed, has recently been put upon the market. The analysis of a well-known authority shows that the product is exceptionally high in specific gravity and has a large percentage of nitrogen and phosphoric acid. This is not due to the addition of drugs, but is arrived at by using natural grape juice in a concentrated form, by which means the organic phosphates in the wine are materially increased. The wine is, moreover, guaranteed to be compounded exclusively with British beef, and as the extract employed is prepared by The British Drug Houses, Ltd., its excellence and purity are assured. The proprietors have supplied to the medical profession throughout the United Kingdom the analysis referred to, which is as follows:—

Specific gravity	...	1062·20 per cent.
Alcohol (by vol.)	...	19·12 ,,
Solids	...	20·42 ,,
Nitrogen ...	...	0·111 ,,
Mineral constituents	...	0·74 ,,
Phosphoric acid		
Equal to ...	...	0·168 ,,
Phosphate of lime	...	0·367 ,,

Residents in tropical countries should find it particularly efficacious in cases of lassitude, inertia and debility, as well as in convalescence from tropical diseases.

Personal Notes.

India Office.

From April 5 to May 17.

Arrivals Reported in London.—Lieutenant-Colonel T. W. Stewart, I.M.S.; Lieutenant-Colonel M. Aker, I.M.S.; Lieutenant Colonel C. Crawford, I.M.S.; Major E. L. Perry, I.M.S.; Lieutenant-Colonel E. Wilkinson, I.M.S.; Major F. E. Baines, I.M.S.; Major C. R. Pearce, I.M.S.; Major C. M. Goodbody, I.M.S.; Major A. B. Fry, I.M.S.; Major A. G. McKendrick, I.M.S.; Major F. O. N. Mell, I.M.S.; Major J. H. McDonald, I.M.S.; Lieutenant-Colonel J. T. Calvert, I.M.S.; Major H. M. Mackenzie, I.M.S.; Captain P. L. O'Neill, I.M.S.; Captain T. C. Rutherford, I.M.S.; Captain J. L. Lunham, I.M.S.; Lieutenant-Colonel G. W. Jenney, I.M.S.; Major H. M. Cruddas, I.M.S.; Major E. A. C. Matthews, I.M.S.; Captain J. B. D. Hunter, I.M.S.; Captain A. E. Grisewood, I.M.S.; Lieutenant-Colonel J. J. Bourke, I.M.S.; Major W. R. Battye, I.M.S.; Captain H. E. Stanger-Leathes, I.M.S.; Colonel G. F. A. Harris, I.M.S.; Lieutenant-Colonel C. R. M. Green, I.M.S.; Lieutenant-Colonel J. Penny, I.M.S.; Major V. E. H. Lindesay, I.M.S.

Extensions of Leave.—Lieutenant-Colonel G. Bidie, *M.D.*, I.M.S., 6 m., M.C.; Captain W. Gillitt, I.M.S., 2 m.; Lieutenant-Colonel R. H. Castor, I.M.S., 6 m., M.C.; Lieutenant-Colonel K. Prasad, I.M.S., 11 days; Major C. B. Harrison, I.M.S., 7 days, M.C.; Major de V. Condon, I.M.S., 10 days; Captain W. H. Riddell, I.M.S., 6 m., M.C.; Captain F. T. Thompson, I.M.S., to December 11, 1913; Captain M. J. Quirke, I.M.S., to June 16, 1913; Captain R. E. Lloyd, I.M.S., 9 days; Major E. L. Ward, I.M.S., 6 m., M.C.; Captain J. L. C. Little, I.M.S., 6 m., M.C.; Captain S. A. Ruzzak, I.M.S., 5 m.; Major W. G. Hamilton, I.M.S., 5 days.

Permitted to Return.—Major C. B. Harrison, I.M.S.; Major L. P. Stephen, I.M.S.

List of Indian Civil Officers on Leave (including Military Officers under Civil Rules).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Battye, Major W. R., I.M.S., India Foreign, Rajpootana.

Bourke, Lieutenant-Colonel J. J., I.M.S., Assay Master, India, 24 m., February 3, 1913.

Calvert, Lieutenant-Colonel J. T., I.M.S., B., Med. Dept., 9 m., March 8, 1913.

Crawford, Lieutenant-Colonel J. M., I.M.S., U.P., 8 m. 15d., March 7, 1913.

Dennys, Colonel G. W. P., I.M.S., C.P., 8 m., February 28, 1913.

Gage, Major A. T., I.M.S., B., Med. Dept., Botanical Survey.

Grisewood, Captain A. E., I.M.S.

Hunter, Captain J. B. D., I.M.S., 18 m., January 14, 1913.

Lunham, Captain J. L., I.M.S., Bo., 9 m., March 20, 1913.

McDonald, Major J. H., I.M.S., Bo., 6 m., March 19, 1913.

McKendrick, Major A. G., I.M.S., 24 m., February 24, 1913.

Mell, Major F. O. N., I.M.S., C.P. Gaols, 19 m., March 18, 1913.

Perry, Major E. L., I.M.S., Punjaub.

Rutherford, Captain T. C., I.M.S., C.P. Med., 33 m. 18 d., March 5, 1913.

Wilkinson, Lieutenant-Colonel E., I.M.S., Punjaub Sanitary Comm.
Woolley, Major J. M., I.M.S., Port Blair.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Aker, Lieutenant-Colonel M., I.M.S.
Baines, Major F. E., I.M.S.
Bidie, Major G., I.M.S., to December 20, 1913.
Cruddas, Major H. M., I.M.S., to March 31, 1914.
Graham, Captain D. L., I.M.S., to August 24, 1914.
Jenney, Lieutenant-Colonel G. W., I.M.S.
Mackenzie, Major H. M., I.M.S.
Matthews, Major E. A. C., I.M.S.
Moore, Lieutenant-Colonel C. M., I.M.S., to April 3, 1914.
Nauth, Major B., I.M.S., to October 14, 1913.
O'Neill, Captain P. L., I.M.S.
Pearce, Major C. R., I.M.S., to March 15, 1914.
Quirke, Captain M. J., I.M.S., to June 16, 1913.
Riddell, Captain W. H., I.M.S., to December 18, 1913.
Stanger-Leathes, Captain H. E., I.M.S., to December 13, 1913.
Stewart, Lieutenant-Colonel T. W., I.M.S.
Thompson, Captain F. T., I.M.S., to December 11, 1913.
Woods, Captain J., I.M.S., to January 29, 1914.

COLONIAL MEDICAL SERVICES.

West African Medical Staff.

4th June, 1913.

No deaths.

No transfers.

Retirements.—E. E. Maples, M.D., B.S.Lond., F.R.C.S. Eng., L.R.C.P.Lond., Medical Officer, Southern Nigeria, retires on pension; C. W. S. Boggs, L.S.A.Lond., Medical Officer, Gold Coast; H. Fleming, M.B., Ch.B., B.A.O.Dublin, Medical Officer, Sierra Leone.

Resignation.—G. M. Gray, M.D.Glas., F.R.C.S.Eng., Medical Officer, Southern Nigeria.

New Appointments.—The following gentlemen have been selected for appointment to the Staff: T. A. Dowse, M.R.C.S. Eng, L.R.C.P.Lond., D.P.H.Cantab, Gold Coast; J. M. Benson, M.B., Ch.B.Edin., Northern Nigeria; E. H. Mayhew, M.D., B.C.Cantab, M.R.C.S.Eng., L.R.C.P.Lond., Sierra Leone; E. M. Condy, M.B., B.Ch., B.A.O.Dublin, D.P.H.Belfast, Gold Coast; F. M. P. Rice, M.R.C.S.Eng., L.R.C.P.Lond., Southern Nigeria; F. E. Whitehead, M.R.C.S.Eng., L.R.C.P.Lond., Sierra Leone; G. G. P. Beckett, M.D., B.Ch., B.A.O., L.M. Dublin, Gold Coast; W. A. Young, M.B., Ch.B.St.Andrews, Sierra Leone.

Other Colonies and Protectorates.—E. G. E. Arnold, M.D.Durham, M.R.C.P.Lond., has been appointed District Medical Officer, Medical Officer of Health, and member of the local authority, Lautoka, Fiji; T. R. Boyd, M.B., Ch.B.Edin., has been selected for appointment as a Medical Officer in Fiji; W. M. Chambers, L.R.C.P. and S.Edin., L.F.P.S.Glas., has been selected for appointment as a Medical Officer, in the Federated Malay States; V. T. W. Eagles, L.R.C.P. and S.Edin., L.R.F.P. and S.Glas., has been selected for appointment as a Medical Officer in the Federated Malay States; G. D. Freer, M.B.Lond., M.R.C.S. Eng., L.R.C.P.Lond., D.P.H. (R.C.P.S.Eng.), has been granted leave from his duties in the Federated Malay States; V. Blacher Kyle, M.D., B.Ch., B.A.O.Dublin, L.M.Rotunda, has been selected for appointment as a Medical Officer in the Straits Settlements; Miss E. M. Layman, M.B., B.S.Lond., has been selected for an appointment as a Lady Medical Officer in the Federated Malay States; Miss L. S. McLean, M.B., Ch.B. St. Andrews, has been selected for appointment as a Lady Medical Officer in the Federated Malay States; A. J. McClosky, M.D.Edin., Medical Officer, Grade 1, Federated Malay States, is acting as Senior Medical Officer, Selangor, Negri Sembilan, and Pahang, in consequence of the departure on leave of Dr. G. D. Freer; C. R. Maitland Pattison, L.R.C.P. and S.Irel., L.M. Irel., has been selected for appointment as an Assistant Medical Officer at the Leper Asylum, Makogai Island, Fiji; G. S. Richardson, L.M.S.S.A.Lond., has been selected for appointment as a supernumerary Medical Officer in Jamaica; L. H. Taylor, M.B., B.S.Lond., M.R.C.S.Eng., L.R.C.P.Lond., has been selected for appointment as a Medical Officer in the Federated Malay States.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Arizona Medical Journal," Phœnix, April, No. 4.

Undulant Fever.—Yount and Looney report five cases of undulant fever occurring in Arizona during the past eighteen months. Their first patient was a goatherd. In June, 1911, he developed fever and malaise, with pain and aching in the bones. During July the fever and aching were worse, so that he had to give up his work as a herd. He felt chilly at times and had profuse perspirations at nights. On August 4 he took to bed, but did not remain in it all day. Chills continued at night with profuse perspirations, this lasting for two months. He did not consult a physician, as the nearest one was fifty miles away. Later on "rheumatism" developed in the right hip, right leg, and both shoulders, and constipation continued obstinate. In February, 1912, the right testicle began to swell, and this was accompanied by slight chills and constant chilly sensations. The organ swelled to about four times its normal size and became very tender to pressure. Temperature, 102° F. Blood and serum were drawn off from the testicle, and gave a positive agglutination with the *Micrococcus melitensis*. The second and third patients used goat's milk or cereals. The fourth patient used goat's milk and worked with goats. The fifth patient drank goat's milk and assisted in herding the goats. All the patients were in some way connected with the goat-raising industry. [There seems to be no doubt whatever, from the symptoms described above, that the disease is undulant fever, and its association with the goats is most striking.]

"Bulletin of Entomological Research," vol. iv, Part 1, pp. 1-93, May, 1913.

The above number of the *Bulletin* contains the following original articles: "Notes on Insect Pests in Antigua," by H. A. Ballou; "On Some Nondescript Anoplura and Mallophaga" (illustrated), by Bruce F. Cummings; "Further Notes on African Culicidæ" (illustrated), by F. W. Edwards; "On the Bionomics of the Sandflies (*Phlebotomus*) of Tokar, Anglo-Egyptian Sudan," by Harold H. King; "Note on an Entomological Store-box suitable for use in the Tropics," by Harold H. King; "Some Observations on the Larva of *Auchmeromyia luteola, F.*," by Dr. Robert E. McConnell; "The Distribution of *Glossina* in the Ilorin Province of Northern Nigeria," by Dr. J. W. Scott Macfie; "On a New African Species of Coccidæ" (illustrated), by Dr. J. W. Scott Macfie; "Notes on Scale-insects (Coccidæ)" (illustrated), by Professor R. Newstead; "On Two Varieties of *Glossina morsitans* from Nyasaland," by Dr. J. O. Shircore; "On a New Species of Mymaridæ from Trinidad" (illustrated), by Charles O. Waterhouse.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

SOME OBSERVATIONS ON ANKYLOSTOMA INFECTION IN THE UDI DISTRICT OF THE CENTRAL PROVINCE, SOUTHERN NIGERIA.

By E. J. Wyler, M.D.Lond.

West African Medical Staff.

These investigations were made with a view to ascertaining the extent of ankylostoma infection in the Udi District, and with the idea of trying to arrive at some estimate of its effect upon the public health. A few points in connection with treatment I have thought of sufficient interest to include. The results set out are based entirely on examination of the prisoners in Udi jail during a period of eight consecutive months. The convicts examined came from over sixty-five different villages, scattered widely over the district, which is approximately 1,537 square miles in extent. There can be no doubt, therefore, that they are representative of the population as a whole (about 460,000), but allowance has to be made in the interpretation of my statistics for the fact that they are for the most part persons of young adult or middle age.

Extent of the Infection.—Out of 200 cases examined 199 were found to be infected, and it may thus be said that the infection is practically universal among the natives of the district.

I found both *Ankylostoma duodenale* and *Necator americanus*.

This widespread helminthiasis is due to absence of all sanitary precautions.

The natives—outside the European station—use no latrines of any kind. They build their villages in "bush," and any more or less retired spot is used for defæcation. The conditions of moisture and temperature amidst the "bush" are well suited to the development of the ova, the dissemination of which is further aided by fowls, which are everywhere allowed to run at large, and scatter fæces about with their feet after scratching in them.

Moreover, "It has been shown by direct experiment that ankylostoma eggs can be fed to chickens, and larvæ readily hatched from the eggs when they are subsequently passed by the fowls. In this way infection might be disseminated very widely. Possibly also by flies"[3].

Ova were quickly found (within a minute or two and often seen in the first field) in 187 out of the 200 cases. In only one case had a second or third slide from the first sample of dejecta examined to be prepared. In nine cases no ova were found in the first sample of dejecta examined, but were found in the second sample. In one case no ova were found in the first two samples, but were found in the third sample. The dejecta were in all cases examined without subjection to special treatment for separation of ova. From consideration of these facts I conclude that the average infection is a heavy one.

The dejecta of the uninfected case were examined five times at intervals of two weeks, only *Trichocephalus trichiura* ova being found. This case is of interest in that the subject was a man of some education, formerly an interpreter, who had worn boots for seventeen years. All the other prisoners were "bush" men and women belonging, with few exceptions, to the Ibo tribe.

Association of Ankylostoma with other Helminths.

In a series of 200 infected cases:—

In 44 per cent. ankylostoma was the only infection.

In 12½ per cent. it occurred with *Ascaris lumbricoides*.

In 29 per cent. it occurred with *Trichocephalus trichiura*.

In 12½ per cent. it occurred with ascaris and trichocephalus.

In 2 per cent. it occurred with tæniasis and trichocephalus.

Anæmia.

With the exception of a varying degree of eosinophilia, and occasionally some micro- and poikilocytosis, blood films showed no abnormality due to helminthiasis. This was even so in the cases (see below) with œdema of the feet and cardiac dilatation due to anæmia.

Of 100 consecutive hæmoglobin estimations:—

5	had	60	per cent.	hæmoglobin.
8	,,	65	,,	,,
29	,,	70	,,	,,
23	,,	80	,,	,,
14	,,	90	,,	,,
21	,,	100	,,	,,

In this connection it may be pointed out that the degree of anæmia found by different workers in ankylostome infected localities varies considerably. Thus in one series of cases in Porto Rico "about half the agricultural population (*i.e.*, about 300,000 persons) appear to have had 50 per cent. or less of hæmoglobin. This is in marked contrast to the degree of anæmia found among Belgian coal miners. Of 200 cases recorded by Hermann and Dascotte, only two had less than 60 per cent."[3].

By reason of the kind of instrument I was using (Hall's rotary hæmoglobinometer) I can only claim approximate accuracy for my figures, but it will be seen that the degree of anæmia agrees on the whole with that found by Hermann and Dascotte.

"In 1899 Ashford found (in Porto Rico) that the prevalent anæmia was due to ankylostoma and not to malaria and bad food, as had been commonly supposed"[3].

From observation of the effect of treatment, I think that this remark is probably equally true of the anæmia prevalent here.

Circulatory Changes.

Out of 200 cases:—

Cardiac dilatation with hæmic bruits was present in six cases (=3 per cent.). All improved after thymol treatment.

Œdema of the feet, not ascribable to any other cause than ankylostoma infection and cured by treatment with thymol, occurred in four cases (=2 per cent.).

Of 100 pulse-rate estimations (taken with due regard to the avoidance of variations dependent upon emotion):—

Fifty-four were normal (72).

Thirty-six had bradycardia (three of these had a rate of between 42 and 48 per minute; seven had a rate of between 50 and 54; and twenty-six a rate of between 57 and 62).

Ten had tachycardia (seven of these had a rate of between 82 and 87 per minute, and three had a rate of 96).

While, of course, small variations from the normal are of no clinical significance, the high proportion of cases with brady- and tachycardia seems to me to be worthy of record. In no case was the pulse irregular in rhythm.

Temperature.

Under the conditions of prison practice in a "bush" station I found it was not feasible to take continual temperature readings. I found, however, that the pulse-rates appeared on the whole to bear no definite and consistent relation to the temperature.

Digestive Disturbance.

The number of cases of digestive trouble (epigastric pain, diarrhœa, &c.) were relatively numerous. I have, however, not thought it worth while to give statistics under this head, since change of diet and conditions of life incidental to incarceration, and concomitant helminthic infections make it impossible to ascribe such symptoms directly to ankylostoma. But there is, of course, no doubt that this infection predisposes to such troubles.

Skin Lesions.

None of my cases showed any evidence of infection through the skin of the feet (ground itch), nor have I met with any such evidence in the district. In my hospital practice, however, a very large number of natives have presented themselves complaining of an itching eruption on the nates and thighs, often occurring in repeated attacks, and occupying the part of the buttock and thigh which, in squatting and reclining, would be in contact with the ground. The eruption is papular and discrete; never vesicular; occasionally with a superimposed pus infection.

I venture to suggest, though with some hesitation, that this may be a site of entry of ankylostoma infection.

Treatment.

There appears to be no doubt that thymol is the most efficient anthelmintic for this disease [3]. I have found it perfectly safe, and from perusal of some of the literature on the subject one feels bound to conclude [4] that many of the evil effects ascribed to the drug are really due to improper administration. Some writers advocate a light or fluid diet on the day preceding treatment. But it seems to me of the greatest importance that no food whatever should be given on the day preceding the administration of the drug, or on the day itself until at least six hours after the last dose of thymol, and I think it very probable that neglect of this precaution has sometimes enabled sufficient fat or oil to gain admission to the intestinal tract to cause a toxic dose to be dissolved and absorbed. (I have made it an invariable rule to exclude meat—on account of the accompanying fat—and also, of course, palm oil from the first meal after treatment.) Though the number of cases treated by me by the 90 gr. method (see below) is too small to enable absolute conclusions to be drawn, the fact that no toxic symptoms of any kind were displayed in any of my cases suggests that with proper precautions the drug may be administered in this dose with safety.

It was given in the following way when the 90 gr. dose was employed:—

(1) On the previous day no food of any kind, and at 4 p.m. 6 drachms of sulphate of magnesium.

(2) On the following morning:—

At 6 a.m. 30 gr. of thymol
At 7 a.m. 30 ,, ,,
At 8 a.m. 30 ,, ,,
At 4 p.m.* 6 dr. mag. sulph.

(3) From 6 a.m. until noon the patients were kept recumbent.

When the 60 and the 40 gr. dose was employed it was given in two equal doses, one at 6 a.m. and the other at 7 a.m., with the precautions above described.

The thymol was always given in a finely triturated state and washed down with a little water. The two smaller doses were tried in order to ascertain whether an efficient anthelmintic action could be obtained with them, but they were soon abandoned in favour of the 90 gr. dose.

The dejecta, not specially treated for the separation of ova, were examined one week after thymol administration, with the following result:—

Of seventeen prisoners who received the 40 gr. treatment ova were found in eight (=47 per cent.).

Of forty-seven prisoners who received the 60 gr. treatment ova were found in fourteen (= 29·7 per cent.).

Of fifty-seven prisoners who received the 90 gr. treatment ova were found in six (= 10·5 per cent.).

The examination of the dejecta as I have carried it out is only, of course, a very rough test of the relative efficiency of the 90 gr. treatment, but I give the figures for what they are worth.

It would seem desirable in a routine practice to give at any rate two 90 gr. treatments, since only a certain proportion of the worms (about 90 per cent.) are expelled at the first onslaught.

* This hour was chosen on account of its convenience in prison practice.

Conclusions.

Hook-worm infection is practically universal among the natives of the Udi District.

The average individual infection is a heavy one.

Both *Ankylostoma duodenale* and *Necator americanus* are found.

Pure infections occur in about 44 per cent. of the cases.

About 79 per cent. of the population is anæmic, though the anæmia is rarely profound.

Approximately half the adult population has a normal pulse-rate.

Ground itch does not occur (on the feet).

The 90 gr. thymol treatment is probably quite safe when given with proper proportions.

Remarks.

An observer of the Ibo people of this district cannot fail to be struck by their general poor standard of physique, their incapacity as carriers and workers, and their obvious disinclination for bodily exertion.

As testimony to their indolence and poor physique, I cite the following remarks of Mr. G. H. Fleming, Chief Surveyor, Onitsha-Udi Railway Survey, whose wide experience of West African negroes lends additional emphasis to his views. In a letter to me, from which he kindly allows me to quote, he says:—

"I have had the following different tribes working for me during the past twelve years: Timinies and Mendies (Sierra Leone); Kroo, Waussa, and Fantis (Gold Coast); Yoruba, Haussa, and Ibo (Southern Nigeria).

"Out of the whole lot I find that the Ibo is the most indolent.

"The Mendies are the best workers as labourers; a man will do double the amount of work in one day that an Ibo will do. The Ibo is also a poor carrier."

It would be of no small interest to know precisely to what extent the tribes mentioned by Mr. Fleming are infected by the hook-worm, for it seems not improbable that the saturation of the inhabitants of this district with ankylostoma infection, bringing in its train grave systematic changes, probably produced by actual toxic absorption [5] (Weinberg) and other minor changes, such as digestive troubles, which, though transient, are none the less productive of considerable disability, is largely responsible for some of the tribal characteristics of the Ibos in these parts, and that these features are not ascribable either to malaria or bad food *per se*.

Moulded as are the characters of tribes, as of nations and individuals, to a great extent by their physical conditions, I think that we may have here a picture of the effect of chronic poisoning by an intestinal parasite on a large community. In the words of Boycott (Milroy Lectures, 1911):—

"Taking the world as a whole, with the possible exception of the malarial organisms, ankylostoma is, I suppose, responsible for more unhappiness and inefficiency than any other parasite, and, for the most part indirectly, for no inconsiderable number of deaths. Practically all tropical countries are permeated with the worm, and in places where the conditions for its propagation are not unfavourable it may reduce four-fifths of the population to a continual state of chronic ill-health which is only terminated by their premature decease, commonly from some secondary infection."

A knowledge of the exact geographical distribution beyond the Udi borders of the heavy infection which obtains here would certainly afford no little assistance in arriving at a just estimation of its economic effect upon the people.

The great prevalence of the infection, with all its attendant disabilities, is of massive importance, not only from the standpoint of the medical officer or of the student of eugenics, but also from its influence, probably profound, on commercial prosperity [2].

And in view of the mining operations which will shortly be in progress in the Udi District, ankylostoma here assumes a very definite economic importance in connection both with European and native labour, to which the extensive measures that have had to be taken against the infection in the coal districts of Belgium, of Northern France, of Westphalia, and in the metalliferous mines of Cornwall, amply testify.

References.

[1] Burton Nicol. "Observations on the Effect of various Drugs in Expelling Hook-worms," Journal of Tropical Medicine and Hygiene, January, 1912.

[2] Sir Patrick Manson. "Tropical Diseases," 4th ed., p. 720.

[3] A. E. Boycott. "Ankylostoma Infection," *Milroy Lectures*, 1911.

[4] E. E. Lindeman. "Treatment of Hook-worm Disease," *Journal of American Medical Association*, 1910.

[5] Siccardi. *Archives de Parasitologie*, vol. xii, 1910.

A REPORT ON ANKYLOSTOMIASIS IN THE NORTH NYASA DISTRICT.

By P. C. Conran.

Lately Medical Officer, Karonga, Nyasaland.

In June, 1912, on my assumption of duty as Medical Officer at Karonga, I was requested by the Principal Medical Officer to investigate the extent of ankylostomiasis infection in the district. In the course of my observations I found that a large number of cases were complicated by the presence of other helminths in the intestines, notably *Schistosomum hæmatobium*, so that these also are included in my report.

It is noteworthy that my observations extended over the dry period of the year only, that is to say, the period during which the minimum number of infections occur.

The fact of my arrival becoming known, a large number of natives came to the dispensary for treatment, not only from Karonga itself, but also from distant villages.

A large number of these complained of pain in the epigastrium, "as if something were biting them inside," accompanied by constipation or diarrhœa, often with blood in the stools, examination of which

revealed the presence of ova of ankylostomum, schistosomum, or both.

The number of cases which came for treatment showed that there must be a very great many natives who, while harbouring parasites, refrained from coming owing to lack of severe symptoms or for other reasons.

I now proceeded to make preparations from the stools of 522 natives who were taken, haphazard and irrespective of age or sex, from Karonga and the adjoining villages.

These preparations were examined after as short an interval as possible, and the presence or absence of ova noted. My results are seen in Tables I to IV.

TABLE I.

Ova	Number of persons infected	Percentage of total number examined
Ankylostomum ...	211	40·42
Schistosomum ...	169	32·38
Ascaris	47	9·0
Trichocephalus ...	8	1·54
Negative	87	16·66

TABLE II.

Ova	Men. Per cent.	Women. Per cent.	Boys. Per cent.	Girls Per cent.	Infants Per cent.
Ankylostomum	44·0	42·67	30·0	32·35	45·83
Schistosomum...	31·0	16·0	48·57	44·12	29·17
Ascaris	5·0	11·33	1·43	8·82	22·92
Trichocephalus	1·0	1·33	1·43	2·94	2·08

TABLE III.

Ova	Chisindiri Per cent.	Kambombo Per cent.	Mwangolera Per cent.	Mwambungo Per cent.
Ankylostomum	41·6	25·4	43·4	50·9
Schistosomum ..	31·6	38·1	38·5	38·18
Ascaris	3·3	6·3	13·2	10·9
Trichocephalus	—	—	2·4	—

TABLE IV.

Ova	Number of persons infected	Percentage of total number examined.
Ankylostomum alone	149	28·54
Ankylostomum and Schistosomum ...	62	11·85
Schistosomum ...	98	18·77

Table I shows the number of individuals infected with ankylostomum, schistosomum, ascaris, and trichocephalus respectively, each number expressed both in actual figures and as a percentage of the whole number examined.

The schistosomum ova were in nearly every case of the lateral-spined variety. In a few instances, however, terminal-spined ova were seen, possibly owing to admixture of urine with the stool.

Table II shows the comparative incidence of the infection in the case of men, women, boys, girls, and infants.

The result of the extent of the disease among children is seen in the exceedingly high infant mortality in the district, diseases from which a healthy child would easily recover proving fatal owing to lack of resisting power.

Table III shows the variation observed in regard to locality in some of the larger villages of the neighbourhood.

It is noteworthy that Mwangolera and Mwambungo, the districts with the highest percentage of ankylostomum infections, lie inland at some distance from the shore of the Lake, while Chisindiri and Kambombo are near the mouth of the River Rukuru.

In the two former districts the whole population derives its water supply from the Upper Rukuru and its tributaries or from shallow pools; in the two latter, from the Lake or the wide mouth of the river. As regards race, the bulk of the population round Karonga is Wankonde; Chisindiri, however, is a Wahenga village.

Table IV indicates the relative number of pure and of mixed infections in the case of ankylostomum and schistosomum.

Judging from my observations, melæna is never observed with the naked eye in the case of a pure ankylostomum infection. When schistosomum is present, however, the case may closely simulate one of dysentery, almost pure blood being passed with mucus, and accompanied by marked griping and tenesmus.

Having by this time ascertained to some extent the condition of the Karonga district, which probably typifies the whole strip of flat country lying along the shore of the Lake between it and the inland hills, I proceeded to Fort Hill, which is situated at an elevation of 4,400 ft. and at a distance of about 40 miles from the Lake. Here I examined the stools of 100 natives from the small

TABLE V.

Ova	Number of persons infected out of 100 examined
Ankylostomum	13
Schistosomum	11
Ascaris	7
Trichocephalus	2
Negative	67

TABLE VI.

Ova	Men Per cent.	Women Per cent.	Boys Per cent.	Girls Per cent.
Ankylostomum	15·79	16·22	12·0	5·26
Schistosomum ..	10·53	8·11	8·0	21·03
Ascaris	5·26	5·41	8·0	10·53
Trichocephalus	—	—	4·0	5·26

and scattered mountain villages. My results are shown in Tables V and VI. These natives were mostly of the Mambwe tribe, and their water-supply is derived from mud-holes, shallow pools, and streams which are rapidly flowing during the rains, but almost stagnant during the dry season, at the latter end of which they are represented by a series of pools.

In December I was transferred elsewhere, but I venture to think that the foregoing statements are sufficient to indicate with some degree of accuracy the state of North Nyasa in general as regards infection with the helminths considered.

Bass states that, in examining stools for ankylostomum ova, some 20 cases per cent. examined are missed. This being so, the true number of natives infected at the Lake level is probably 60 per cent. of the total, and in the hills about 33 per cent.

A few observations on the subject of the chief symptoms and signs observed in my cases of ankylostomiasis, and of the chief difficulties to be overcome in the institution of efficient prophylaxis, may not be out of place.

Most of the symptoms usually described were observed, but certain of them were particularly emphasized. Of these the most constant were pain and tenderness in the epigastric region, symptoms of which all the cases who came for treatment complained. Next, in order of frequency, came dyspnœa, palpitation, weakness, dizziness, headache.

Joint pains, simulating rheumatism, were common. Many patients complained of blood passed with the motions, but this was invariably accounted for by the presence of schistosomum infection. From information indirectly obtained it seems certain that earth-eating is common, especially among children. Every patient, however, stoutly denies the fact when questioned concerning his own case.

The chief signs were a dull, listless, vacant expression; a coated, flabby, enlarged tongue; rapid, low-tension pulse; hæmic murmurs, and flabby muscles.

No reliable information concerning ground itch could be obtained, owing to the fact that my observations were made during the dry season. Few cases had any recollection of a definite attack.

Treatment, whether with thymol, Beta-naphthol, or eucalyptus and castor oil was most successful, especially when the vermifuge was followed by a short course of iron.

In every case the patient at once began to put on weight, his intellect became clearer, the troublesome symptoms disappeared, and his capacity for work increased daily.

Prophylaxis offers difficulties which cannot be appreciated unless one is already acquainted in some measure with the special local condition in North Nyasa, so that the following short description of these may be of use.

The natives of the district belong to various tribes, of which the chief are the Wankonde and the Wahenga, who inhabit the strip of low-lying land along the shore of Lake Nyasa, and a large portion of the mountainous hinterland as well.

Several other tribes are scattered among the hills to the north and west, such as the Mambwe and Awemba, and, with a few Swahili and Arabs, complete the entire population.

As regards their mode of living, for the present purpose all the aforesaid tribes can be classed together. All live in so-called villages which, for the most part, consist of widely scattered groups of huts, each group being connected with the rest of the village by narrow bush paths. Each village thus covers a large area and has no definite boundaries, and, although there is a headman, his authority, such as it is, only extends over the immediate neighbourhood of his own hut.

The Wankonde and, to a less extent, the other tribes are enthusiastic cattle breeders, and all grow maize, millet, and other grain, almost everyone working in the fields during the months immediately preceding and during the rains.

Their diet is mainly vegetarian, but fowls, eggs, and fish are used as a relish, fish being caught for the most part during the rains.

It is of interest to note that Looss states that a pure vegetable diet produces a less favourable medium for ankylostomum ova than a mixed diet. Now both fish and fowls are more abundant near the Lake, where ankylostomiasis is rife, than in the hills, where it is comparatively rare.

Their water-supply is derived to a very small extent from the Lake; more often from rivers and their tributaries, especially during the rains; most often, at any rate, during the dry season from muddy water-holes.

Defæcation and micturition are performed, whenever the desire arises, at the nearest spot sheltered, or partly sheltered, from the public gaze. If the person concerned is on a path he steps into the bush or one side of it; if in a village he makes his way to the nearest clump of bushes, a shady spot that has probably been used for years for the same purpose, and which, every rainy season, must be saturated with very slightly diluted fæces mixed with the sandy soil. During the night he is afraid to venture so far from his hut, and merely goes a few yards from his door to a spot where his children may be playing about next day.

In the bush near a village, therefore, we have, during the rains, all the chief factors favourable to the existence of ankylostomum infection in a district, namely, a high temperature, the optimum being from 77° to 95° F., moisture, shade, and dilution of the fæces with sand. So that, during at least five months in the year, natural conditions and the habits of the people combine to produce an ideal state of things for the production of ankylostomiasis on a vast scale.

In the dry cool months from May to September, however, and even in the heat of October and November, the conditions are much less favourable to the spread of the disease. The south-west wind dries up the soil; the temperature falls below the optimum; the long grass withers and the leaves fall from the trees, allowing the direct sunlight to reach

the soil. There are now no rains to scatter the fæces, mix them with sand, and help to apply the infective material to the skin.

In addition, the soil over a great part of the district is very efficiently disinfected, for the natives, in order to prepare it for cultivation, kindle the long grass, and great bush fires sweep over the country, sterilizing the surface of the ground. These fires are allowed to burn close to the huts, and by the end of November a comparatively small area of the bush is left untouched.

Thus one would expect that there would be an annual rise in the number of fresh and of acute cases of ankylostomiasis during the rains, followed by an annual fall during the dry season, and my observations fully confirmed this view.

Any patient, when questioned, will date his troubles from the rainy season, and, although no reliable statistics are obtainable, the constant sound of wailing throughout the district testifies to the great rise in the mortality at this time of the year.

The above brief description of the local conditions will, I hope, make it clear that before any prophylactic measures can be successfully applied a drastic reform of the village system is necessary.

Preventive measures, to be effective, must attain three objects:—

(1) To destroy the mature worms in the bodies of the population.

(2) To prevent the growth and existence of larvæ in the places where they develop.

(3) To prevent infection by larvæ that have developed.

(1) The first object can be effected by a systematic examination of the natives, and treatment of those in whose motions ova are found. Under present conditions this would be a most difficult task, but with concentration of the villages, the installation of responsible headmen, and a census of the population, it would be rendered comparatively simple.

(2) The second object resolves itself into the prevention of soil infection. If an efficient public latrine were installed in each village and the inhabitants induced to use it, the disease would steadily decrease and eventually disappear.

Here, again, the scattered arrangement of the huts and the lack of any local authority nullify any efforts in this direction. Under improved conditions each headman would be responsible for the sanitary state of his village, and by periodical visits from the Medical Officer or Resident would be induced to do his duty.

The latrine should be of as simple a description as possible, such as a deep trench or pit, sheltered by an open thatched shed, and so situated that it cannot be flooded during the rains.

(3) Prevention of infection by larvæ is to be effected only by educating the natives with regard to the subject. This, under improved conditions, could be done firstly through the village headman; secondly, through the native teachers at the mission schools. A few of the headmen to whom I have spoken on the subject quite realize the gravity of the situation, and would willingly assist the Medical Officer. The native teachers for the most part have been educated at Livingstonia, where great interest is taken in the subject, and the Minister at Karonga would gladly arrange for the instruction of the members of his school.

ON THE IDENTITY OF INFANTILE AND DONOVAN'S LEISHMANIA (KALA-AZAR).

By Professor Umberto Gabbi.

Rome.

Marshall's [1] recent experiments with regard to the susceptibility of Sudanese dogs to the infection of Leishmania from the splenic juice of individuals suffering from kala-azar are of no small value, when one considers that in the Sudan, beside the cases which occur in infancy and adolescence, some adult cases are also found [2].

Wenyon [3] and Mayer [4] both have maintained that Sudanese Leishmania is almost identical with Mediterranean kala-azar, but definite proof was lacking of the susceptibility of dogs to infection by the human virus. This has now been obtained, however, by the above-mentioned experiments, from which it follows that dogs, especially very young ones, are easily infected. Sudanese Leishmania (kala-azar) is thus shown to be identical with that of the Mediterranean Basin, since it is capable of infecting dogs as well as monkeys [5], and thus the difference in age disappears entirely.

From previous experiments, also by Marshall, it has been shown that the parasite lives not only in the N.N.N. medium (Nicolle's modification of Novy and MacNeal's medium), but also in citrated blood, which, according to some, is not the case with the Italo-Tunisian Leishmania. In this connection it is right to mention what Nicolle [6] has written with reference to this point:—

"Rogers has obtained cultures from the blood of rats, to which sodium citrate had been added, but these cultures could not be transplanted, and in the opinion of other authors who have performed the same experiments, they cannot be obtained with any certainty of result. I have failed in two attempts that I have made with this medium, but my failure signifies nothing."

In Italy, both Jemma and Lorgo obtained positive results, and recently Spagniolio also. It is therefore a matter of astonishment that any should insist on this difference in character, because they have not succeeded, out of a limited number of experiments (six), in obtaining the culture (Pianese, Petrone), whilst Nicolle, who can really speak with authority on the subject, has written what we have quoted above. Nicolle [7], however, insisted neither on this, nor even on the characteristic of the non-infectibility of Indian dogs, nor on that of age, for he writes: "For this reason, without waiting for proof to be given me of the susceptibility of the dog to the Indian virus, I admit, and declare that I believe kala-azar to be one disease and indivisible in whatever country it is seen in, and whatever the age of the subject."

After the recent investigations which have caused the disappearance even of the smallest differences, it seems strange that he should have taken back his old opinion, without any proof to the contrary, and, without being attacked, have given himself up to a lively controversy.

The reader must judge for himself, and will appreciate his conduct. As for me, I can only conclude that Marshall's experiments deal a final blow to the theory of difference, founded on a flaw by those who, in full daylight, close their eyes and say that the sun does not shine, because they refuse to look at it. Their contradictions enable us to judge of the logical value of their arguments on the question which is before us.

LITERATURE.

[1] MARSHALL. *Journal of the Royal Army Medical Corps*, September, 1912.
[2] BOUSFIELD. *Transactions of the Society of Tropical Medicine and Hygiene*, April, 1912.
[3] WENYON. *Kala-azar*, *Bulletin* No. 3, p. 162.
[4] M. MAYER. "Uber Leishmanien." ("Handbuch der pathog. mikroorg." Kelle und Wassermann. E. Fischer, 1912.)
[5] MARSHALL. *Journal of the Royal Army Medical Corps*, September, 1911, p. 255.
[6] NICOLLE. *Archives de l'Institut Pasteur de Tunis*, 1911. No. 2, p. 125.
[7] *Arch. de l'Institut Pasteur de Tunis*, 1909. No. 2, May. (In this number, on p. 124, he writes as follows: "It is known on the other hand that there have been authenticated cases of adult kala-azar in Egypt and in Crete." While he has written recently: "It is well to know that in Mediterranean countries the existence of adult kala-azar still remains to be proved!!!" *Arch. de l'Inst.* No. 3, 1912, p. 196.)

"Lancet," June 21, 1913.

A Spirochæte in the Blood.—Helen Chambers describes a new spirochæte found in human blood. She states that the organism is extremely common, so much so that it occurs in almost every specimen of blood examined, whether from the sick or healthy. She describes the technique which is required to demonstrate it. So far successful cultivations have not been obtained. She concludes that the organism is identical with some of the numerous forms of spirochæte which occur on ulcerated lesions and that the pathogenic effects of the organism, if any, have still to be determined.

[In the *Lancet* of June 28, 1913, Balfour, Hunt and McLeod all write to say that this supposed new organism is only a fallacy, and is not a real parasite.]

"Indian Medical Gazette," June, 1913.

Spirochætosis in the Darjeeling District.—Jukes states that during the months of September and October, 1912, he had the opportunity of commencing the investigation of some cases of fever caused by a spirochæte, which he believes to be hitherto undescribed. The materials were very scanty, but sufficient, he thinks, to enable him to draw some conclusions from them.

In every case the illness was severe. The temperature was irregular and showed no resemblance to that of relapsing fever. No relapses occurred in the case of those who recovered.

The spirochætes disappeared before death or recovery, and their disappearance was accompanied by a leucocytosis, and there appeared to be no crisis.

Jukes is disposed to regard this as a fever caused by spirochætes, and hitherto undescribed; there are many points about it, however, which require further study, and it would be unwise, he thinks, to speak too certainly about it for the present.

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THE JOURNAL OF

Tropical Medicine and Hygiene

JULY 1, 1913.

THE DEATH OF A GREAT CLINICIAN.

SIR JONATHAN HUTCHINSON'S death removes from amongst us one who was the greatest clinician of his time. He has been styled the foremost general practitioner of his day, a tribute to his ability which implies a mastery of many subjects, and indicates his all-pervading knowledge. Surgery claimed his energies in the first instance, and his services to the science and art of this branch of medicine were conspicuous even at a period when such men as Syme and Ferguson flourished, when Paget laid the foundations of surgical pathology, and when by the genius of Lister modern surgical methods were initiated and established. But surgery pure and simple was not sufficient in its scope to satisfy one endowed with Hutchinson's abilities and fertility of mind. As an ophthalmologist he attained pre-eminence; and as a dermatologist his investigations and observations have become classical. Nor was the range of his

studies limited by immediate professional work. In several branches of science Hutchinson found recreation; and the members of the London Polyclinic must recall with pleasure, when at a demonstration clinical material gave out, how they were fascinated and instructed by some of the great master's addenda on subjects of a biological or purely botanical nature. Even as a farmer Hutchinson's pure-bred shorthorns attained considerable fame. Many-sided to a degree, he touched no subject he did not illuminate and advance. His professional work depended for its foundation, development and conclusions on patient observations and careful records. The observations he rejoiced in were purely clinical, that is, signs and symptoms as opposed to laboratory work as we know it to-day. The microscope, when Hutchinson began to study disease, played but an unimportant part in medicine, and applied bacteriology was unknown. It may perhaps be said of Hutchinson that he was the last of the great clinicians of the old school. Jenner knew nothing of modern laboratory methods, yet by clinical study alone he settled the diagnosis of typhoid for all time. Hutchinson placed the subject of the heredity of syphilis on a scientific basis by years of patient clinical study. On several occasions the writer has been favoured with his remarks on modern methods in relation to clinical observations. None of these were perhaps more pertinent than when the subject of the relations of yaws to syphilis was brought forward. Hutchinson long maintained that yaws and syphilis were related, and held that in fact yaws was the original source of modern syphilis. Shortly after the spirochæte was found in syphilis Castellani found a spirochæte in yaws. The writer hastened to inform Hutchinson of the fact, and congratulated him that the two diseases he long thought associated were now proved to be allied etiologically if not identical, thereby confirming his previous statements. His good-natured smile was tinged with something akin to amusement and deprecation as he remarked: "There was no need of microscopic investigation to prove that point; more attention to the study of disease, and less time spent on culturing microbes in test tubes would be better for the individual and for our increase of knowledge. Mind you, I do not wish to detract from laboratory work or say a word against it, but I would like to see disease studied more at the bedside and at our clinics than it is to-day. Mere test-tube knowledge will never make a capable practitioner of medicine; that can only be done at the bedside and by careful observation and study." Hutchinson was always very concerned at the absence of what he called the "study of disease" at the present day, and in no department was he more outspoken than when talking about ophthalmology. He held that "ophthalmic men all over the world were devoting themselves to the adjustment of spectacles, but that no one as far as he could make out was working at the diseases of the eye." All these no doubt seem old-fashioned notions and out-of-date ideas to modern clinicians who look upon the ward laboratory as an essential addition to our methods of diagnosis and the rational treatment of disease. We are not all Jenners and Hutchinsons, and the faculty of observation and the study of the meaning of signs and symptoms are given but to few, so we are thankful for the presence of laboratory workers amongst us to help us in our dilemmas and to clear up faulty diagnosis. Yet it must come about that the very fact that we rely more and more upon these welcome adjuvants, so the less are we called upon to develop the faculty of observation, which perhaps reached its climax with the two great clinicians referred to.

Sir Jonathan Hutchinson's name will ever be associated with the study of leprosy, and more especially with his well-known belief that to uncooked and ill-preserved fish was to be traced the cause of leprosy. He had few, if any, actual believers in this theory of his, and the chief work of leprologists during the past quarter of a century has been to refute this doctrine. The absence of bacteriological confirmation of his idea carried little or no weight with him; he had anticipated several such relationships in other directions which laboratory workers had proved to be correct, and he regarded their announcements with a little touch of amusement when he was told of these corroborations. Similarly, their want of confirmation was as amusedly smiled upon when it was represented to him. His belief in his observations in the relationship of fish eating to leprosy, in spite of world-wide opposition, was brought home to everyone by the journey of Hutchinson, when well-nigh an octogenarian, to India and South Africa, where with the keenness of the most ardent youthful enthusiast he scoured these countries, note-book in hand, in the quest of evidence to support his contention. We may or may not agree with his belief in this matter, but we cannot but admire the enthusiasm, the clinical acumen, the wide knowledge, and, above all, the power of observation possessed by this remarkable man. He has lived to the ripe age of 85, and not a moment of his life has been wasted. In even his exercises he was studying and observing; a country walk was but an opportunity for studying geology, to which he was devoted; the natural history of the fields, the hedgerows, the ponds, the rivers, the forests, and the birds and other game that fell to his gun. The museums he founded and developed at Haslemere, in Surrey, where he lived, and at Selby, in Yorkshire, where he was born, will remain as permanent monuments to his memory; and it is to be hoped that the Polyclinic in London, to which he devoted his time, his talents, and his money will be developed into a national institution in commemoration of the genius of a great man.

Annotations.

Liver Abscess and the Emetine Treatment.—Marvellous results of the treatment of amœbic dysentery and amœbiasis generally with emetine continue to be reported. Sewell (*Journal of the Royal Army Medical Corps*, No. 6, June, 1913, vol. xx) now reports a case of amœbic abscess of the liver which had burst into the lung, cured by emetine hydrochloride. After rupture of the abscess into the lung the cavity in the liver was opened and drained, but though improvement was at first noticed pus began to be discharged again through the lung in increasing amounts. A second operation on the liver was performed and pus again found, but though, just as before, a slight improvement appeared, the patient soon relapsed into his old condition. Sewell then tried injecting emetine hydrochloride, starting with a third of a grain and increasing the amounts until $2\frac{1}{3}$ grains in all had been taken. After this treatment the patient's general health improved rapidly. He regained his appetite, slept well, and felt a new man. His cough improved at once, and the sputum gradually diminished in quantity, until eleven days after the commencement of the treatment the cough and expectoration ceased altogether.

The discharge from the tube, which was very free before emetine was given, also decreased rapidly, and the tube was finally removed.

After this the only difficulty was in supplying him with as much food as he wanted, and he left for England on board the transport "Rohilla," in the best of health, and weighing 9 st. 13 lb., having gained 2 st. 1 lb. in six weeks.

The Health of the Canal Zone.—John L. Phillips, Acting Chief Sanitary Officer of the Isthmian Canal Commission, in his report for April, 1913, states that the total number of deaths from all causes among employees was 51, divided as follows: Disease 24, and violence 27, giving the annual average per 1,000 of 4·84 and 5·45, respectively.

Among employees for the month of April each year the annual average death-rate per 1,000 was as follows:—

	Total	Disease
1905	10·95 ...	—
1906	30·00 ...	29·12
1907	38·67 ...	35·22
1908	7·77 ...	4·56
1909	8·57 ...	7·01
1910	13·04 ...	8·62
1911	9·38 ...	6·42
1912	11·38 ...	8·77
1913	10·29 ...	4·84

The annual average death-rate per 1,000 in the cities of Panama and Colon and the Canal Zone, including both employees and civil population for the month of April each year, was as follows: 1905, 39·29; 1906, 39·06; 1907, 40·97; 1908, 20·04; 1909, 16·77; 1910, 19·73; 1911, 17·74; 1912, 17·21; 1913, 21·18.

In segregating according to race, the annual average death-rate per 1,000 from disease among employees was: For whites 2·82, and for blacks 5·39, giving a general average for disease of 4·84. For the same month during 1911 the annual average death-rate per 1,000 from disease among whites was 2·85, and blacks 7·67, giving a general average of 6·42; and in 1912 from disease among whites 3·74, and blacks 10·48, giving a general average of 8·77.

Among employees during the month, deaths from the principal diseases were as follows: Lobar pneumonia, 5; organic disease of the heart, 3; tuberculosis, 7; leaving 9 deaths from all other diseases, and 27 from external violence.

No cases of yellow fever, small-pox, or plague originated on or were brought to the Isthmus during the month.

A New Ankylostome of Man.—In the *Indian Medical Gazette*, vol. xlviii, No. 6, Calcutta, June, 1913, Major Clayton Lane describes the occurrence of *Ankylostoma ceylanicum* in man. Looss first described this species in 1911, finding it in material from a civet cat, sent to him by Willey, of Colombo. He applied the name *A. ceylanicum* to it, and stated that so far as was known it only infected wild animals. Major Lane, while examining stools at a jail at Berhampore, found ankylostomes in three cases which did not conform to the ordinary type of human parasite. They were shorter and thinner, and when subjected to microscopic examination were seen to be examples of *A. ceylanicum*. The teeth in the mouth capsule of this latter species differ from those of *Ankylostoma duodenale* and *Necator americanus*.

Major Lane says it is not possible to determine to what extent the parasite infests man in Bengal. Having hitherto taken for granted that there were only two human ankylostomes in India which could be easily distinguished by the naked eye (the two are, of course, *A. duodenale* and *Necator americanus*), and having disposed of the worms he had collected up to a recent date, he is at present unable to offer any facts as to the frequency with which *A. ceylanicum* occurs as a human parasite. Looking back on the ankylostomes he has collected, he is under the impression that he has previously found it occasionally in small numbers.

It is scarcely necessary to point out, Major Lane goes on to say, that the discovery of this worm as a human parasite introduces an entirely new factor into the question of the prevention of human ankylostomiasis. *Necator americanus* has not been found up to the present time except in man and the gorilla; *Ankylostoma duodenale* has never been found except in man. Their practical prophylaxis is concerned with man alone. *Ankylostoma ceylanicum* is a constant parasite of healthy domestic animals in the part of India from which Major Lane writes. Should the time ever come when an anti-ankylostome campaign becomes necessary or practical in India, and should it turn out that *A. ceylanicum* is at all a serious factor in human ankylostomiasis, then the problem of prevention will entail, not merely the freeing of man from his parasites, a difficult enough matter seeing that, in the immense majority of cases of infection, this is, in India, so slight that

it produces no symptoms, but also the similar treatment of healthy dogs and cats, and probably jackals, and other canines and felines. In other words the task would be impossible. It does not, however, appear at all probable that *A. ceylanicum* is at present a numerously occurring human parasite; and, judging by the well-known history of the genus, it is not easy to see how any increased domesticity of the dog and cat (a change in habit which appears likely to take place, as Indians gradually adopt European customs) will produce through their means a greater measure of human infection than that which is at present in existence.

Abstract.

PROTECTIVE INOCULATION AGAINST CHOLERA.*

By W. M. HAFFKINE.

IN his preface Haffkine writes that the present note has been written in connection with certain official correspondence regarding vaccination against cholera and the preparation and study, in India, of a devitalized form of anti-cholera vaccine. The purpose of the paper has rendered it desirable to make certain references to the support which the author's personal views have received so far from the results of other workers.

The work is divided up into three parts, as follows:—

Part I deals with the preparation of an anti-cholera vaccine;

Part II with immunization of man against cholera; and

Part III with the anti-cholera vaccine after its devitalization.

PART I.—PREPARATION OF AN ANTI-CHOLERA VACCINE.

The Virus of Cholera.

The preparation of a vaccine comprises a number of separate problems, the first of which is that of identifying and selecting an appropriate strain of the specific virus. In the case of cholera this problem is rendered complicated by the fact that the various specimens of virus found in patients and in inanimate nature present considerable differences, and that, further, the properties of individual specimens undergo comparatively rapid alteration in the course of their cultivation in the laboratory.

The Cholera Virus as found in Nature.

The following details may illustrate the matter as regards the condition of the virus in nature. The form of the germ varies from a curved rod, or "comma," to a small oval speck, or to a long and straight, or slightly undulated bacillus. The germ is endowed with spontaneous movement; but the mode of that movement and the apparatus which produces it are not always the same, while some specimens show no mobility at all. Again, the cholera microbe, like a number of other germs, secretes a ferment with which, when planted out on solidified gelatine, it digests and liquefies the jelly. The dissolution is seen to take place to some distance around the mass of microbes and to form a clearly delineated fluid area. As is well known, the figure of this area is typical for various species of germs and for the cholera bacillus in particular, and is made use of as a diagnostic feature, for distinguishing species of microbes; but in the case of the cholera germ there may occasionally be no liquefaction at all, or, on the contrary, the whole mass of gelatine contained in the culture tube may become rapidly and completely dissolved. The secretion of other ferments by these germs is similarly uncertain. As a rule, the bacilli grow in milk without causing in it visible alteration; yet some strains bring about a rapid coagulation of that medium. On vegetable substances certain representatives grow luxuriantly, and others do not grow at all. A few specimens found in patients were phosphorescent in the dark, but the vast majority do not manifest this property. The serum of immunized animals and man, when put in a cultivation vessel in contact with a watery emulsion of cholera germs, agglutinates these into lumps and causes them to fall to the bottom of the fluid. Many of these germs are sensitive to the minutest additions of such serum; but others remain practically unaffected. A fairly characteristic feature of a cultivation of microbes is its ability or otherwise to dissolve the red corpuscles of the blood. In the case of cholera some apparently true strains have been observed to produce this effect; but the vast majority do not do so.

Practically all other properties of the cholera germ show similar variations; but the most essential are obviously those which concern its relations with animals and man. Cholera bacilli have generally no virulence for the lower animals, or are harmful to them only when inoculated in certain peculiar ways. Even then the morbid symptoms caused by the inoculation have no resemblance to human cholera. Strains have, however, been met with which caused death even to the resistant species of animals, in whatever way inoculated, while the character of the disease produced in them was singularly analogous to the disease in man. The virulence of the germs also differs greatly, for a lethal dose may vary as much as from 1 to 500. Again, in man, the main seat of the development of these bacilli is the mucous membrane of the small intestine; they do not invade the circulating blood, the subcutaneous tissue or the muscles, and when experimentally introduced into those tissues in animals, cholera germs, as a rule, rapidly die out; yet specimens have been found which, in these circumstances, speedily penetrated into the whole system of the inoculated animal.

Variability of some degree is proper to all germs, as it is to higher animals and plants; but the cholera microbe is one of those in which, owing to their organization and mode of life, that variability is particularly marked; so much so that not infre-

* Calcutta: Thacker, Spink and Co. London: W. Thacker and Co., 2, Creed Lane, 1913.

quently, after an examination with all available tests, it is impossible to say whether the germ dealt with is, or is not, a representative of the cholera species.

The above *résumé*, Haffkine thinks, will be sufficient to show that, in dealing with the problem of preparing a vaccine for cholera, it is essential first very carefully to consider the various points in favour of and against the particular variety of the germ which should be selected as authentic and appropriate.

The Cholera Virus in the Laboratory.

The fact next confronting the operator is that, in the course of, sometimes, a short interval, the specimen selected undergoes " spontaneous " alterations of considerable importance, some of a temporary, others of a seemingly permanent character; so that a plan based on the properties of the virus as seen originally does not hold good for very long. A cholera germ, for instance, which, when first obtained, has been dissolving blood corpuscles, coagulating milk, digesting gelatine and albuminous matter and deoxidizing colouring substances, such as litmus safranine and methylene blue, may, after a time of laboratory cultivation, show none of such effects. In the most important properties—those concerning the pathogenic effects of the virus—a decrease in strength, in a short time, in the proportion of, say, 75 to 1, and ultimately the total disappearance of virulence is of no unusual occurrence. This means that, if at first a given dose of that virus has been prescribed for producing a certain desired effect, later on any quantity smaller than seventy-five times the original one may fail to give the expected result. Instability of virulence has come to be regarded as a characteristic feature of the cholera microbe, and where this peculiarity is not sufficiently pronounced, the fact has been treated as an objection to admitting the cholera nature of the germ. The marked mutability thus observed in *one and the same* specimen renders, of course, less paradoxical the differences which distinguish various specimens of these bacilli.

VIRULENCE AND IMMUNIZING POWER.
Their Inter-relation.

Turning now to the main subject of Part I of this Note, namely, the preparation of a vaccine against cholera, Haffkine says, it is of importance to examine into the question as to whether variation of observable characteristics, such as mentioned above, carries with it variation in the immunizing faculties of a virus.

In the experiments which the author carried out on this subject in 1890-1892, he observed repeatedly that a cholera germ of a low degree of virulence conferred on animals less immunity than a germ of high virulence. The special features of the preparation of the cholera vaccine, the effects of which were subsequently studied in India, were based on this fact. The inter-relation just stated may be taken as a basis for a general working rule; but this need not exclude the possibility of so-called " exceptions," for it is conceivable that, in isolated instances, some, yet undefined, peculiarities of a germ may intervene and disturb the habitual position of the case.

Observations by other Workers.

The fact of the relationship in question between the virulence and immunizing faculty of a cholera germ has now been confirmed by many experimentalists. Some three years after the publication of the above-mentioned process of cholera vaccination, on the conclusion of his first inoculation studies in India, Haffkine had the privilege of discussing the matter with the late Koch, Pfeiffer, and Kolle, of the Institute for Infectious Diseases in Berlin. Soon after that conference Pfeiffer and Kolle tested the subject in connection with the typhoid bacillus, and, in the subsequent year (1896), with the bacillus of cholera. In 1897, having visited Bombay with the German Imperial Plague Commission and studied the plague there, Pfeiffer, in collaboration with Friedberger, investigated the same point in application to the plague bacillus. It must be remarked that the latter germ, as found in patients or preserved in a laboratory, differs from the germ of cholera by a much greater stability of properties. On various occasions bacilli of plague, kept under observation for several years, even when subjected to multifarious processes, of which some were of a nature to weaken, and others to increase their virulence, showed no appreciable modification of strength. This circumstance simplifies greatly the work of preparing a prophylactic from the plague germ. Nevertheless, specimens of that germ of *different* virulence are met with in nature and can also be produced artificially, and so the question as to the relationship between virulence and immunizing power can be tested on this virus also. In all instances—cholera, typhoid, and plague—the above investigators found that the result of immunization stood in direct connection with the virulence of the germ used; that as the virulence rose or fell, the protection afforded to the inoculated was greater or less.

In 1903 the point under consideration came again under discussion. The problem of combating cholera had, at the time, acquired importance in the new American possessions in the Philippines, and the matter was submitted to a fresh study in the Institute in Berlin, this time under the direction of the well-known German pathologist, Wassermann. The experiments were conducted by Strong, the Director of the Government Biological Laboratory of Manila, who published, in the subsequent year, detailed accounts of that inquiry. Strong applied in this study such procedures of measurement and calculation as the subject admitted. In his words, Pfeiffer and Friedberger's experiments on the relationship of virulence and immunizing power " seemed of such great importance that it was decided to repeat them, and, in addition, to perform them in as accurate a comparative way, with relation to the virulence of the stem, as practicable. This seemed desirable because in Pfeiffer's

and Friedberger's work, as far as can be ascertained from their article, no attempt was made previously to determine the exact relationship of virulence of the different stems to one another."

Haffkine believes the investigation was undertaken in a spirit of scepticism as regarded the relationship in question; but Strong's findings were ultimately summarized as appears below. He experimented with two different specimens of cholera germs, "virulent" and "avirulent," the strength of which stood in the proportion of 15 to 1. The variation in virulence was, therefore, very far from reaching the limits previously mentioned; yet it sufficed to give clear indications of its effects on the immunizing power. Strong states:—

"It became evident that the rabbits inoculated with the virulent culture always furnished better serum than those inoculated with the avirulent one; but that the value, in both agglutinative and bactericidal properties, of the serum from the animals treated with the former was in no case (?) more than two and one-half times that of the serum furnished by the animals treated with the latter stem.

"By the intravenous injection of the living organisms in quantities of one-half *Oese*, the ratio representing the bactericidal value of the sera of the animals inoculated with the virulent and the avirulent organisms was never greater than $4\frac{1}{2}:1$; that is, the virulent organisms never furnished a serum more than four and one-half times as potent as the avirulent one. Therefore, it cannot be said that the immunity obtained was directly proportional to the virulence of the organisms, since the latter was 15 to 1 before inoculation. However, with the digested extracts of the organism of different strains and the killed organisms of the different degrees of virulence this may, within certain limits, be said to be the case.

"As the results were somewhat at variance with the ideas of Haffkine and quite different from what Pfeiffer and Friedberger found upon the intravenous injection into rabbits of dead cholera spirilla of different degrees of virulence, it was decided to repeat them. Accordingly, a second series of animals was inoculated just as the first, and on the day of inoculation, as in the previous series, the virulence of the injected organisms was verified as 15 to 1. The result was practically the same, for at the end of eight days the examination of the sera showed that the virulent stem had in only one case given a serum of more than about two and one-fourth times the bactericidal value of that produced by the avirulent one. In this one case the avirulent serum was between one-fourth and one-fifth as strong."

While thus confirming, as Pfeiffer, Kolle, and Friedberger had done before, the fact that by a stem of higher virulence higher immunization effects were produced, Strong opposed the view that there was a simple numerical proportion between the two values. The divergence, even thus restricted, is, however, lessened further, inasmuch as in Strong's plan of experiment there appear to be certain features which tend to mask the true proportions, namely, to reduce part of the numerical values recorded by him; and as, further, on devitalizing the virus, or using its extractions, he observed, as stated in the above quotation, results actually approximating to the proportions he expected.

In conformity with these findings, in 1907, the same experimentalist emphasized the importance of using, for the preparation of cholera vaccine, stems of germs of the highest virulence, namely, in connection with the inoculations which he carried out for the suppression of the cholera outbreak in Manila in 1905. Similarly, Pfeiffer, in a communication to the International Congress of Hygiene and Demography in Berlin, in September, 1907, took the opportunity of reiterating his conclusion as to the importance of using fully virulent stems for the preparation of *typhoid* vaccine. On yet another occasion, when testing the matter in application to *plague* and examining the immunity of animals treated with live cultures of different strengths, Strong ascertained, as Pfeiffer had done in 1897 in regard to devitalized cultures, that the virulence of the stem was of decisive importance in this instance also, the immunity conferred on the inoculated animals rising concurrently with the rise of the virulence. Accordingly, in some of the laboratories situated in non-infected centres and having no facilities for regularly renewing their stock of plague bacilli, special measures are taken for maintaining the virulence of the germ used in manufacturing the plague prophylactic.

The necessity of using fully virulent strains of germs for the preparation of the cholera vaccine has been acknowledged also by Japanese bacteriologists, and similarly, in 1910, Aaser, in Christiania, laid stress on the same point in preparing vaccine for the cholera inoculations which he carried out in that town.

Microbial Virulence and some of its Elements.

In the present exposition the words *virulence* and *pathogenic power* are used as meaning the capacity of a stem or species of germ to live in an animal and produce in it morbid effects. To this end a germ requires a variety of properties, some of which enable it to resist the adverse effects of the animal's tissues and humours, others to derive food from the same elements, and others again, to produce in the animal morbid symptoms. A stem of pathogenic germs which has lost, or has been artificially deprived of, one or more of these faculties, loses its virulence for the animal, though the rest of its characteristics may remain intact.

The actual nature of the properties here referred to varies with the species of germ and with the nature of the animal for which the germ is virulent, but a few peculiarities common to considerable groups of pathogenic microbes have been observed and some of them minutely studied. Such are, for instance:—

(1) The faculty of resisting various specific substances in the animal body—"agglutinins," "bactericidins," "alexins," bacteriolysins"—

which tend to destroy the germ; or of absorbing and thus neutralizing these substances; or of producing others—"aggressins"—which seem to ward off and injure the protective elements of the body.

(2) The faculty of calling forth in the system of the animal the formation of the defensive substances mentioned in the foregoing paragraph, or of others of similar purpose, such as "stimulins," "bacteriotropins," &c.

(3) The faculty of comparatively rapid growth and multiplication.

(4) The faculty of producing and setting free poisonous substances or "toxins," which cause morbid symptoms in the animal, and so on.

The author believes that at present it would not be a safe procedure to consider a germ *pathogenic* or *virulent* if it possesses one or some of the above properties, singled out above the others; or to declare an animal *immune*, if it resists a germ "virulent" in that restricted sense. A true vaccine is perhaps best defined as one which prepares the individual to face the virus in its most common manifestations in outbreaks.

General and Special Features of the Problem under Consideration.

Peculiarities dependent on the Nature of the Germ.

The above observations go to show that the immunizing power of a germ varies with its virulence; and in order to produce a vaccine of given definite efficacy, a strain of virus is required of as definite a degree of pathogenic strength. The germ of cholera being of the varying and unstable nature mentioned above, the problem of anti-cholera inoculation, as a measure of practical application, becomes dependent on the possibility of steadying that virus on an adequate level of potency, namely, on a level sufficient for conferring on man immunity from epidemic cholera.

These requirements were overlooked in an experiment of cholera vaccination which was tried in Spain in 1885 by the Barcelona physician, Ferrán. In this attempt use was made, for inoculating man, of different specimens of cholera germs obtained from patients and employed alive in the condition in which they were obtained, or which they assumed spontaneously afterwards. The plan corresponded to that, still prevalent in some parts of the East, of inoculating man with virus from a patient attacked with a mild form of small-pox, and is known as variolization, in contradistinction from vaccination. The procedure takes no account of the peculiarities of the virus found in the patient, that is to say, of the question as to whether the virus is actually mild and yet possesses the requisite degree of potency to be immunizing, or whether the mildness of attack is due to the patient's individual resistance which masks the true character of the germ. These circumstances must have had some part in influencing the outcome of the Barcelona experiment; for, according to the inquiries made at the time by numerous government commissions deputed to observe the operations, the trials gave uncertain, in some instances clearly negative, and on the two special occasions when a Spanish Government commission, associated with Dr. Ferrán, watched the events, directly disadvantageous results. The procedure was therefore not adopted in other countries, and was discontinued in Spain.

Peculiarities of the present Problem as concerns Animals.

The problem set forth in the preceding lines, of creating and preserving in a virus stable and uniform qualities, necessitates as an essential condition that the germ be maintained in appropriate uniform circumstances of nutrition and multiplication. When the particular properties which it is desired to fix in a microbe are those which concern its relation to the animal body, the plan for achieving the object is to make the germ live in that definite relation to the animal selected. Thus, in the classical instance of Jenner's vaccine, the desired uniform qualities of cow-pox lymph are maintained by continued cultivation in the skin of the calf. In this instance the plan offers no complications, as the virus has its natural abode in the skin of cattle.

In the case of cholera the method which suggests itself for maintaining the germ on a steady level of virulence is, similarly, that of cultivating it in the tissues of an animal; but man is the only animal known to suffer from the disease; lower animals do not contract it spontaneously, and when the virus is injected into them artificially, it is, as a rule, rapidly destroyed, as previously mentioned.

The Virus of Cholera in Animals and Animal Humours.

Experimental Cultivation in the Intestine.

The first attempt at solving this phase of the problem was made in 1888 by Gamaleia, a pupil of Pasteur's, who tried the plan of introducing the cholera germ into the intestinal canal of the guinea-pig and transferring it subsequently from the intestine of the first animal into that of another, and so on, in a continuous series of cultivations—the obvious reason for the plan being that, in its development in man, the cholera germ affects the intestinal tract. The digestive organs are, however, an inconvenient medium for the artificial cultivation of a germ; for, among other reasons, these organs are already inhabited by vast masses of microbes, which, according to their species, interfere in one way or another with the development of the newcomer. In the case of guinea-pigs and other lower animals the circumstances are unfavourable to the growth of the bacillus of cholera; so, after a certain number of transfers from animal to animal, the series generally breaks down, and the germ disappears from the intestinal contents, as was seen repeatedly in trials made in Paris. A modification of the procedure was then attempted in which the cholera bacillus, after its cultivation in the intestine

of one animal, and preliminarily to being transferred into that of another, was freed from extraneous germs, so that it might get a fresh start in each new host. This plan involved operations tending partially to counteract the desired effect; for the technique of separating the cholera germ from others necessitates its maintenance, for some generations, in *artificial media*, that is, outside the tissues of the animal to which it is desired to acclimatize it. From this or other causes, Pfeiffer and Nocht, who performed many experiments on the intestinal infection of animals with the germ of cholera, found it impossible to raise the strength of that virus to such a degree, for instance, as would make it virulent to birds.

Cultivation in Animals outside the Intestine.

To meet the above difficulties, Gamaleia proposed to cultivate the cholera virus in the thoracic cavity of animals, namely, of pigeons, the thorax being free from extraneous germs. This plan proved successful in the case of a microbe much akin to that of cholera and designated by Gamaleia, who discovered it, *Vibrio metchnikivo;* but when the same procedure was applied to the strains of cholera germs then available, it was found that such animals as birds remained immune against infection.

The plan which was tried next was that of Hüppe, of Prague, who suggested the growing of the cholera bacillus in the peritoneal cavity of animals, between the intestines and the outer walls of the abdomen, a region ordinarily free from germs. This plan had failed some time previously in the hands of Vincenzi; but the idea was nevertheless taken up by Pfeiffer, who found that a fatal form of cholera peritonitis could, indeed, be induced in an animal in that way, but that the germ itself perished in the process. In cases in which the virus was still recoverable on the death of the first animal and was transferred into the peritoneal cavity of another, it perished in the latter, or in the third animal, and so continuous cultivation was again found to be impossible. The accuracy of these observations was verified at the time, and on various occasions subsequently by many observers, including Roux and Haffkine.

Cultivation in Animal Humours.

Under these circumstances the author tried to modify the nature of the germ of cholera preliminarily to introducing it into the animal body, namely, to immunize it first against the animal. By a series of cultivations in test-tubes, he gradually accustomed the bacillus to live in meat-broth mixed with increasing quantities of *fresh blood serum*, which ordinarily is inimical to it; until, after a time, the germ became capable of growing luxuriantly in blood serum pure. When it reached this condition it was injected into the circulating blood of an animal.

In cholera the germ, on being introduced into the animal body, instead of rapidly perishing, as is ordinarily the case, struggled on successfully and caused the animal an attack of illness which often ended fatally. The duration of that illness, however, varied greatly, *viz.*, from a few days to several months, and occasionally the animal ultimately resisted. This irregularity of results rendered it impossible to utilize the plan for practical purposes.

The Method ultimately Adopted.

Cultivation in Animal Series.

The problem was eventually solved by reverting to the Vincenzi-Hüppe intraperitoneal injection and working out, from that starting-point, a plan which permitted the cultivation in animals of the germ of cholera, in a state of purity, indefinitely, generation upon generation; the raising of it to a well-determined degree of virulence, sufficient for the protection of man; and its maintenance at that level for an unlimited period of time, with the same certainty of result as obtains in the preparation of small-pox vaccine lymph and of Pasteur's antirabic virus.

Cholera bacilli do not live in the body of man *uninterruptedly*. This fact is expressed when one says that " cholera is not a contagious disease " in the sense of measles or small-pox, *i.e.*, it is not transmitted direct from man to man. The germ obviously needs to spend part of its existence outside the human body; and, indeed, it grows readily in various natural and artificial media, most commonly in drinking water. A peculiarity of its culture in such media is its great avidity for the air, in apparent contradiction of the fact that, when it infects a human being and grows in the intestinal tract, it lives in a medium devoid of oxygen. The alternation of aerobic and anaerobic conditions appears thus to be a marked peculiarity of this germ; and this peculiarity may account for the fact, observed in the course of the author's experiments of 1890-1892, *viz.*, that the chief obstacle to the cultivation of the cholera virus in an uninterrupted series of animals is the continuous deprivation of air.

Another and unexpected condition was found to be the necessity of varying the size of the animals selected for grafting the virus upon.

The formula given by the author in 1892 for obtaining a cholera virus of stable properties, contains the following three clauses:—

(1) The series of cultivations must be begun by giving the first animal a superlethal dose of virus, so as to obtain a rapid effect and to find, upon the death of that animal, in the fluid exudating into the peritoneal cavity, a remnant of resistant germs surviving the destruction of others.

(2) On the death of the first and of each succeeding animal, the serous fluid found in the peritoneum (or else a culture of cholera germs made from that fluid) must be aerated for a few hours, before being injected into the peritoneum of another animal; and, lastly,

(3) For this latter injection, an animal of *greater*

body weight than the previous one must be taken, if the amount of serous fluid found in the peritoneum is small, and *vice versa*.

The Properties of the cultivated Cholera Virus.

The peculiarities imparted to the virus by the above process of animal cultivation are as follows:—

As the germ is being passed from animal to animal its virulence gradually rises, so that smaller and smaller doses of it become sufficient to cause an animal a fatal illness. With the particular strain of virus with which Haffkine then experimented, the dose lethal to an adult guinea-pig gradually sank to one-twentieth, one-thirtieth, and eventually to one-fiftieth of what it had been originally.

The animals successively inoculated succumb after a shorter and shorter duration of illness. In a Parisian breed of guinea-pigs, the time for animals of 350 grm. weight was reduced from twenty hours to eight, the latter period then remaining constant.

The virus becomes fatal to rabbits and pigeons in doses which have been harmless to them before, and inoculation into the depth of the muscles becomes fatal to guinea-pigs.

Inoculation under the skin, in the animals just mentioned, causes mortification of the cutaneous tissues and the subsequent sloughing off of the region concerned.

THE CHOLERA VACCINES.

Vaccine "II."

This was a virus in live condition, brought by the above described procedure of successive cultivations in guinea-pigs to a uniform and stable degree of virulence, such as is obtained in small-pox vaccine lymph by cultivation in the calf. Haffkine designated this *cholera vaccine;* and, for reasons mentioned below, referred to it as cholera vaccine "II." The subcutaneous inoculation of an appropriate dose of this vaccine protected the guinea-pig, the pigeon, the rabbit, and the dog against all such forms of infection with cholera virus as, without previous immunization, were fatal to them. The results were thus found to apply to several species of animals—mammals and birds—which appeared susceptible to the same process of immunization.

Cholera Vaccine "I."

The hypodermic injection into the guinea-pig of the cholera vaccine proper mortifies, as already mentioned, the skin at the seat of the injection and leaves an open wound, which becomes, however, regularly covered with granulations and heals up without suppurating.

To prevent the formation of this wound an *attenuated derivation of the same vaccine* was prepared, and was designated cholera vaccine "I." This, when inoculated in a guinea-pig, not only caused no mortification, but immunized the skin against the deleterious effect of the cholera vaccine proper. The inoculation of this preliminary vaccine alone conferred on the animal also a certain degree of immunity against a lethal infection. These two vaccines were applied to the preventive treatment of man and used in studies in India in 1893-95 and part of 1896.

Inoculation Reaction of Anti-cholera Vaccine.

In 1895 Haffkine ascertained, however—first on himself and afterwards on others—that vaccine "II," when inoculated in the doses prescribed, *without preliminary immunization with vaccine "I,"* had no mortifying effect on the human skin. This result is possibly due to the subcutaneous tissues of man being more inimical to the germs of that vaccine than are the corresponding tissues of the guinea-pig, so that the activity of those germs is arrested before any harmful effects are produced. In accordance with this observation, in all operations on man performed in the summer of 1896 and subsequently, up to 1904 inclusive, and in the operations in Bengal in 1908, vaccine "II" alone was employed. Under these conditions inoculation with that vaccine causes a rise of temperature and a local reaction, developing, on the average, in ten hours, and then gradually subsiding. The length of time required for getting over most of these effects has been ascertained from long observation, and an idea of the subject may be gathered from the correspondence which took place, in 1904, between the emigration authorities of Bengal, who had had several years of experience in the matter. They stated that (1) emigrants arrived at Asansol from the Central Provinces daily at 9 a.m.; (2) were inoculated between 3 p.m. and 5 p.m. of the same day, after they had had their midday meal and some rest; and (3) left Asansol by the 4 p.m. train on the next day.

This arrangement had been in operation uninterruptedly for eight years and had worked satisfactorily.

(*To be continued.*)

Notes and News.

THE summer dinner of the West African Medical Staff took place at the Grand Hotel, London, on Monday, June 16.

Dr. Prout, C.M.G., late Principal Medical Officer, Sierra Leone, presided. Dr. Fagan, late P.M.O. Northern Nigeria; Dr. Tweedie, Deputy P.M.O.; Dr. Best, Prov. M.O.; Dr. Cameron-Blair and Dr. Charteris, P.M.O. of the Gambia; together with a number of past and present medical officers of the staff were present.

Among the guests were Sir H. Just, K.C.M.G., Under-Secretary of State for the Colonies; Sir Ronald Ross, K.C.B.; and Messrs. Baines and Machtig, of the Colonial Office.

Dr. PROUT, in proposing "Success and Prosperity to the West African Medical Staff," stated that this was now the thirteenth dinner. He briefly reviewed

the circumstances which led up to the dinner being held, and thought they were justified in claiming that it had been successful, and the means of bringing together men who would otherwise have had few opportunities of meeting, and promoted a feeling of *esprit de corps*, which was to be desired. He thought the junior members of the Staff did not appear to fully appreciate the advantages of such a gathering, and he hoped the senior members would bring all their influence to bear to get them to attend in large numbers. He believed the West African Medical Staff had opportunities of distinction and work in connection with the building up of our great Empire, which is second to none, and it was a body to which they had every reason to be proud to belong.

He alluded in feeling terms to the deplorable loss the Staff had sustained in the death of Dr. Langley, Principal Medical Officer, Southern Nigeria, a tactful, sympathetic, and popular officer, whose place it would be difficult to fill.

Dr. FAGAN then proposed "The Health of the Visitors," and welcomed them on behalf of the Staff. Sir H. Just was especially welcomed, as representing the Colonial Office, and as showing its sympathy with the aims and work of the West African Medical Staff. He suggested to the members of the Staff that they should not hesitate to let Sir H. Just know their grievances, and he was sure they would be remedied at once.

Sir H. JUST, in responding, said he felt he was there rather under false pretences, as he had not been connected with the West African Department for some years, but at one time, as Private Secretary, he had a great deal to do with the selection of medical officers. At that time the Staff was a very small one; now it was a very large and responsible one, and he congratulated them on their work, and the good results which were now being shown in the diminishing invaliding and death-rates. He would ask them to believe that they had the entire sympathy of the Colonial Office in their work, and that they could rely upon a fair and sympathetic hearing to any representations they might make, with a view to improving the efficiency of the service.

Sir RONALD ROSS, in replying, said he thought the West African Medical Service was destined to rank with the other great services in connection with the British Empire.

At a later period Dr. CAMERON-BLAIR proposed "The Health of the Chairman," and said he regretted that Dr. Prout found he was unable, from pressure of other work, to continue as their President. It was to him the inception and carrying out of the dinner was entirely due, and they owed him a great debt of gratitude for what he had done. He hoped, however, that although he no longer was able to undertake the active management of the dinner, he would always be present and give them his assistance.

Dr. PROUT thanked Dr. Blair for his kind expression of good feeling, and said he was always willing to serve his old Staff in any way he possibly could.

"Australasian Medical Gazette," May 3, 1913, vol. xxxiii, No. 18.

The Destruction of Mosquitoes and other Insects.—Purdey gives a résumé of the recent literature on the subject. Though the campaign against biting insects is moving slowly, nevertheless it is advancing. The destruction of domestic flies is as important as that of any of the other species, and in this connection a letter received by Purdey from the secretary of the largest butchering firm in Auckland, in answer to a communication *re* the effect of introducing screening from flies, is of interest. The letter speaks for itself.

"Sir,—In reply to your favour of the 15th instant *re* the screening of our shop, Dominion Road, we find that it has turned out a great success; the public have appreciated the change, and, in consequence, the cash trade has considerably increased. We found the meat kept better, also a great saving in handling, not nearly so much trimming being required, as the 'blows' from flies were fewer. We also found a great saving in ice, as under the old system of keeping meat in the ice chest during the summer months, made the constant opening to take out joints as required very expensive. As regards ventilation, we do not find that the screens interfere to any great extent, but at the same time, as the electric system extends here, we shall instal fans; at present it would be too expensive. We are so satisfied that the idea is a good one, that we are screening all our suburban shops, and already have ten shops finished in the same style as the one you remember in the Dominion Road. We are, &c."

"Annals of Tropical Medicine and Parasitology," June 10, 1913, Series T.M., vol. vii, No. 2.

A New Species of Tsetse-fly.—Newstead describes a new species of tsetse-fly for which he proposes the name *Glossina severini*. This was discovered amongst Monsieur Severin's collection of tsetse-flies from the Congo. The following are the characteristics of the male of the new species.

Hind tarsi either uniformly dark brown or with the first and second segments slightly paler than the rest; pleuræ and hind coxæ dusky grey, harpes very small, narrow and irregularly serrated distally.

Length (two specimens), 10·3 to 10·5 mm. Length of wing, 10·5 mm.

Palpi relatively long and stout. Third segment of the antennæ clothed with short hair. Thorax very robust, markings well defined and of the usual type or similar to those in *Glossina palpalis*; pleuræ dusky grey. Legs with the hind coxæ grey or greyish buff; tips of front and middle tarsi black; hind tarsi all dark (almost uniformly so in one example), or with the first and second segment slightly paler than the rest. Abdomen almost unicolourous. Genital armature with the superior claspers free, the hairs with which these appendages are clothed very long. Editum with very long marginal hairs, the longest reaching almost to the tip of the vesica; median process narrow, being much less than the width of the inferior claspers and projecting slightly beyond the latter; harpes rudimentary, being quite short and narrow, with the distal margin irregularly serrated.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

A REVIEW OF A CLINICAL STUDY OF MALARIAL FEVER IN PANAMA.

By JOHN PELHAM BATES, M.D.

Ancon, Canal Zone, Panama.

III.

MALARIAL ANÆMIA.

ONE of the distinctive features of the malarial syndrome, after two or three acute attacks of fever, is the anæmia. It rarely fails to manifest itself under such circumstances, and if the attacks continue irregularly for a month to three months, this feature becomes especially marked. The anæmia is in most instances characteristic. It is attended by a rather peculiar leaden hue of the skin, along with pallor, and jaundice of the conjunctiva and mucous membranes. This feature of malaria has attracted the attention of all observers since the earliest times, and it is looked upon clinically, and not without reason, as one of the diagnostic points of the disease. Before the discovery of the malarial parasite, the cause of the anæmia was shrouded in mystery. The manner in which the anæmia is brought about is generally accepted to be in the main by the normal habitat of the malarial parasites in the red blood corpuscles, and the growth of the parasites at the expense of the hæmoglobin and the final destruction of the red cells.

All recognize, however, another factor in the cause of malarial anæmia, at present unknown, that acts as a hæmolysin. This factor may account for the apparent inequality in the degree of anæmia in the primary attacks of malaria, and the number of parasites that can be detected in the blood of the periphery. It must account for the grave destruction of red blood corpuscles and liberation of hæmoglobin in hæmoglobinuric fever, as there can be no relation between the loss of these blood elements and the number of parasites which may precipitate an attack of this latter syndrome of malaria.

A recent writer, Rowley-Lawson [1], has noted the supposed inequality of parasites, and the amount of anæmia following in acute attacks of malaria, as found by Dionisi and others, and undertakes to explain the hiatus by offering the hypothesis of intravascular migration of parasites. She assumes that the parasites found free in the blood plasma can and do re-enter or attach themselves to uninfected red blood cells. It is certainly not a very uncommon sight in stained malarial blood work to see young ring forms free in the blood plasma, or young ring forms attached along the margin of the red corpuscles, or, again, to see parasites at various stages of development free in the plasma, but that they re-enter other red blood cells to continue their destructive process, I think is wholly without any basis of fact. In the first place, the necessity for such a hypothesis is not well taken. As Rowley-Lawson has stated, Dionisi noted that the anæmia seen in primary invasions of malaria is nearly always greater in degree than the number of parasites that can be estimated in the smears of the blood of the periphery would lead one to expect. This, I think, is true, but of late I have come to regard this inequality as more apparent than real. The number of parasites seen in the smears of the blood of the periphery is not always a fair indication of the richness of the infection. As stated in a previous paper, I once held the view that the parasites seen in the peripheral smears represented the number of parasites throughout the circulating medium, to finally have it rudely shaken by the death of a patient in whom, by depending alone on the blood picture of the smears from the peripheral blood, I never once suspected the gravity of the case until pernicious symptoms were already present, eight hours after admission.

Marchiafava and Bignami [2], studying the phenomenon of the migration of the parasites from the red corpuscles, considered that the phenomenon was brought about by the action of quinine on the endoglobular parasites. Be that as it may, they make use of the phenomenon in quite the opposite direction to Rowley-Lawson; that is, to explain why the anæmia is often less in degree than the number of parasites seen in the blood films would indicate. They assume further that the red corpuscles from which the parasites have been driven by quinine remain intact and continue to perform their function. The extruded parasites—though they do not state this specifically—when free in the plasma, cease developing, and are destroyed. This latter inference is in keeping with Bass's findings in cultures *in vitro* that the younger parasites cannot live free in the blood plasma for even a short time, and even the merozoites are phagocyted unless schizogony occurs with uninfected red cells in apposition to the sporulating forms.

Kelch [3] in 1875-76 began a systematic study of malarial anæmia by estimates in the reduction of the red blood corpuscles during the attacks of fever. He determined the reduction of the red corpuscles to be in some cases as much as 2,000,000 to 4,000,000 in a period of twenty-four hours. But as he depended on the clinical symptoms alone for the diagnosis, he must have included other diseases in his studies, notably uncinarial disease. His findings, while true in the main, have not been fully confirmed by later researches—those carried out since the discovery of the malarial parasite.

The most systematic study of this phase of malaria appears to have been made in Italy, principally by Dionisi [4], who, by various studies of the blood changes, that is, the reduction of the red cells, variation in hæmoglobin, the specific gravity, &c., in malarial attacks, found the loss of the red cells to be as much as 2,000,000 per cubic millimetre in the course of an attack lasting from three to four days, or again, a loss of 1,000,000 red cells per cubic millimetre in a period of twenty-four hours. The loss in the hæmoglobin value, it was found in these studies, corresponded fairly constantly with the reduction of the red blood cells. Rogers [5] later confirmed Dionisi's observations with

regard to the equality in the reduction of the red blood cells, and the loss of hæmoglobin value, and offered this characteristic as a point in the differentiation between malarial anæmia and other secondary anæmias. Dionisi [6] also noted that in repeated attacks of fever the reduction of the red blood cells began to become less and less with each succeeding attack until the losses ceased altogether, and finally there began an increase in the red blood corpuscles in spite of recurrent attacks of fever. This increase took place whether the number of parasites seen in the peripheral blood smears were few or many. Brem and Zeiler [7] studying the hæmoglobin value of labourers with malaria in Panama confirmed Dionisi's findings with regard to the increase of the red blood-cells in spite of repeated attacks of fever. They, by estimating the hæmoglobin value of patients through from one to several treated attacks of fever, found that after the fifth or sixth attack there was usually a rise in the hæmoglobin value over patients in whom there had been a less number of attacks.

In 1910 I began a study of secondary anæmia in Panama [8]. In the course of this study the work extended itself somewhat beyond my expectations. Although it was first intended to be confined to secondary anæmias of long duration, I later took up acute secondary anæmias, following the repeated attacks of primary malarial infection. As opportunity has offered the study has been continued to the present time. The cases presented for study divided themselves into three groups. First, acute malaria with irregular attacks extending over a period of from two to three months—outside patients. In these a case of hæmoglobinuric fever was included, as the anæmia of hæmoglobinuria, though more grave, is of the same acute character as that of the acute malarial type. Second, hospital patients with a history of from five to thirteen attacks of fever, in which the attacks had extended over a period of from three to six years. And, third, natives who had spent their lives amid continuous malarial infection with various attacks of fever over this period. This latter group I shall refer to under the head of chronic malaria.

The first one in these groups was a healthy boy twelve years old, who had never had a previous malarial attack. His infection, a simple tertian, had continued over a period of two months, with irregular attacks of fever, and under indifferent treatment. At the end of this period his hæmoglobin value registered 60 per cent. (Dare's). The attacks were here cut short by treatment, and within a period of thirty days his hæmoglobin value registered 102 per cent. (Dare's). The second case in this group was a double tertian infection in an American adult with one previous attack of fever "two or three years ago." This infection had continued irregularly for three months, with an occasional dose of quinine. At the period of his entrance to the hospital his hæmoglobin value registered 55 per cent. (Sahli's), and his red cell count was 2,704,000 red cells per c.mm. of blood, with colour index of 1·07. In the hæmoglobinuric case the hæmoglobin value registered at the beginning of the attack 75 per cent. (Dare's). Twenty-four hours later the hæmoglobin was again estimated, at which time it registered 55 per cent. In the second twenty-four hours another estimate of the hæmoglobin was made, and at this time it registered 45 per cent., while in the third twenty-four hours there was a loss of hæmoglobin of about 5 points, or it now registered 40 per cent. The loss of hæmoglobin here ceased, and as recovery began to take place there was some variation in the hæmoglobin value of no moment. At the time of his discharge the hæmoglobin value had risen to only 45 per cent. No red cell counts were made in this case. But, as we have already seen, the reduction of red blood cells and the hæmoglobin loss is about equal in malaria, it is reasonable to assume that the loss in the red blood corpuscles in this period of seventy-two hours was approximately 1,750,000 per c.mm. of blood.

I shall here take up the cases of repeated attacks, all of which had been under good treatment during each attack. Four of these were studied with the hæmoglobin estimates alone, and one with both hæmoglobin estimates and red corpuscle counts, and seven with red corpuscle counts alone. Of the first four with hæmoglobin estimates alone, their hæmoglobin value was as follows :—

TABLE I.

Case 1, with 5 attacks of fever, Hb* value (Sahli's), 75 per cent.							
,, 2	,, 6	,,	,,	,,	,,	84	,,
,, 3	,, 7	,,	,,	,,	,,	85	,,
,, 4	,, 12	,,	,,	,,	,,	81	,,
,, 5	,, 13	,,	,,	,,	,,	92	,,

* Hb = Hæmoglobin.

In case 5 a red cell count was made, in which the blood contained 5,240,000 red cells per c.mm., with a colour index of ·87 plus. The remaining seven cases with red cell counts alone had had from seven to ten attacks of fever. For the sake of brevity, and to avoid repetition, I shall here give the minimum and maximum counts in these. The minimum count in these cases was found to be 4,240,000 red cells, and the maximum count was 5,310,000 per c.mm. of blood. A number of these counts were repeated at twenty-four hour periods for from three to four days in order to avoid a possible error from counts while the blood volume might be somewhat concentrated from restricted diet, purging, and sweating. There was no change in these repeated counts, however, that could not be accounted for by such errors as will naturally arise in making the different counts. It is of importance to note that all the hæmoglobin estimates and counts first made were made from one to two days after the patient's admission to the hospital, while yet in the midst of the febrile attack. However, most of the recounts were made after the fever had subsided under treatment, yet little or no change in the number of the red cells could be ascertained by these counts. It is still further necessary to note that all the cases here reported were under rather unusually good conditions for the Tropics. Their hours of labour were regular and not over long, usually ten hours a day. They had opportunity for good food, and were encouraged to make use of the

opportunity. When they were attacked by fever, medical attendance was prompt, and if they showed any tendency to a severe illness they were sent to the hospital for further treatment, where they usually remained from seven to twelve days.

This survey confirms in a uniform way the findings of Dionisi [9] with regard to the reduction of the red corpuscles and loss in hæmoglobin value in acute primary attacks of malaria, and the general tendency to an upward rise in both of these elements of the blood in the course of numerous repeated attacks. Apparently this improvement occurs whether the repeated attacks are due to relapses or renewed infection.

Thus, in the acute cases a rapid and profound loss of the red blood-cells and the hæmoglobin takes place, to be as rapidly restored when the attacks are checked by quinine; while in the repeated attacks the tendency is always upward in spite of the continued attacks of fever, until in some cases, as we have seen, the red cells and hæmoglobin are restored almost, or quite, to normal. I have tried in this series of cases to deal with cases in which there could be no other factor to cause the anæmia than malarial infection. I think I have succeeded in this effort.

Hence, I may conclude that where malarial infection alone is the cause of anæmia one may expect first a sharp and marked loss in the hæmoglobin and in the red blood corpuscles. When this has reached a certain point the losses cease; and if then the attack is checked by treatment or spontaneous recovery, in the intervals there will be a rapid rise in both the red corpuscles and in the hæmoglobin. In the next succeeding attack the fall of each is usually lessened, and so on, until finally the losses cease altogether. Here, then, there begins a reproduction of the red cells and hæmoglobin in excess of the losses, in which the red cells usually share in this gain to a greater extent than the hæmoglobin. The human organism has now reached a stage of tolerance to the malarial poison which ends finally in an immunity either relative or absolute. This course of malaria is the one pursued among the "old timers" in malarious countries, whom we speak of as "salted."

All writers on the subject of malaria describe an anæmia which may occur in chronic malaria that does not tend to improve within the intervals of apyrexia, but, on the other hand, after the attacks of fever are cut short the anæmia remains stationary, or it may continue to progressively increase. I shall consider this form of anæmia in the section on chronic malaria.

Chronic Malaria.—In malarious countries the inhabitants dwelling therein are all exposed to malarial infection more or less continuously throughout their lives. Under these circumstances nearly or quite all of the people will be the subject of malarial attacks at some period of their existence. In many, these attacks occur in childhood and even infancy. Of these, such as survive the initial attacks of fever by the possession of a hardy constitution or by treatment are often the subjects of repeated attacks of true relapses, or of repeated reinfection. Most often in those treated the treatment is irregular and insufficient, and the subject becomes discouraged at a never-ending dosing with quinine. He finally reaches a stage where, if the paroxysms are severe, sufficient quinine only is taken to cut short the discomfort, and then it is dropped until necessity drives him to it again. Fortunately, in those who survive several acute attacks a certain degree of immunity is established, relative in some and apparently absolute in others. In the first stages of this process the patient merely gains a tolerance to the malarial poison in which he may harbour rather large numbers of malarial parasites without giving rise to active paroxysms. Thus, in Panama [10], in the native inhabitants that have been studied, this stage of tolerance or latency was found in from 20 to 40 per cent. of those examined. This included children of school age and a goodly portion of men and women. Just how long this tolerance can be maintained without paroxysm, or how long after tolerance is established until actual immunity takes place, is unknown. I presume it varies in different individuals. Subjects in acquiring tolerance and later immunity, go through several attacks of malaria with a certain kind of dosing with quinine, in whom each succeeding attack becomes milder, and the period of apyrexia becomes lengthened. In the tertian malaria I have seen this process extend over a period of eighteen months, to finally cease and never recur, although the subject remained in the same locality and exposed to infection. In some of the quotidian fevers I have known the attack to end in an explosion of hæmoglobinuric fever without another recurrence.

The natives of Panama who have been exposed all their lives to malarial infection, and who have markedly enlarged spleens, I have for convenience classed as chronic malaria. In this class of patients, I have gathered from the history, taking in adult natives, that the period between active attacks of fever have usually been of quite long duration. During a great deal of the time in the intervals between the active attacks of fever, these people must have harboured parasites without symptoms, yet in some of the intervals of long duration it is necessary to assume that they were entirely free from parasites. Thus, young men of from 20 to 35 years of age will state that they have had fever "several times" during childhood and from four to five or six attacks of fever during adult life. The anæmia in such cases as these will be the marked feature, together with enlarged spleens. The hæmoglobin value is found to range from 50 to 70 per cent., and the red blood corpuscle count from 2,000,000 to 3,000,000 or thereabout. Their spleens are in size, from easily palpable to masses filling all the left hypochondrium, and at times extending over in the right as well. These very large spleens are hard, irregular masses, or, again, they hang down as long, tongue-shaped organs. Many of these people reach a degree of anæmia far below that

which is stated here, while others may remain well above these estimates. Thus, in some I have noted the hæmoglobin value to be as low as 13 and 21 per cent., in which the red corpuscle counts are from 850,000 to 1,703,000 per cubic millimetre respectively. Individuals with a hæmoglobin value from 70 per cent. downward must be counted as chronic invalids, though some of those here noted seem to bear up under this condition surprisingly well.

The general description of these cases and the long train of concomitant symptoms are all sufficiently described in the text-books on malaria and I can add nothing to them here. I am only concerned with the etiological factors having to do with these cases of grave secondary anæmia. In a detailed study of eleven of these chronic malarias—or malaria cachexias, as some would have been termed—I ascertained that there was more than one factor entering into their causation. By inquiring carefully into the patient's history of previous attacks of illness it was found that practically every previous illness was simply termed "fever." It was evident, however, that whatever other illnesses they might have had, the most of them were unquestionably malaria. By continuing the inquiry further into their mode of living, it was found that all lived upon a diet low in protein value, and often insufficient in quantity. Thus, they would state that they ate mostly rice, native fruits, dried codfish, and tubers of native growth, such as yams and yucca. Some stated that they often made a meal by chewing sugar-cane. One of the worst stated that "many times" he had gone as many as three days without food. This must have been, however, after he had reached a stage of invalidism in which he was practically unable to go about. Finally, in all the cases studied, examinations of the stools disclosed the presence of uncinarial infection to a greater or less degree. It was further ascertained by treating these people with thymol, and recovering and making an actual count of the worms, that the anæmia corresponded more closely to the amount of uncinarial infection than it did to the number of the previous attacks of "fever." There were variations, of course, in this respect, but it held good as a rule. As is to be expected in the presence of malarial infection and uncinarial infection in the same individual, the anæmia was usually found to be the most grave. In the worst case in this series, with several attacks of fever in his life-time, and at present sick thirteen months, who on admission had a few crescents present in the blood, and whose hæmoglobin value was 13 per cent., I recovered 896 adult uncinarial worms. While on the other hand, in a patient with several attacks of fever in childhood and four attacks in adult life, and whose hæmoglobin value was 50 per cent., I recovered 68 adult worms. This study was carried out in sufficient detail, I think, to enable me to say that I have never seen cases of extreme anæmia in Panama in what may be termed chronic malaria without the presence of uncinarial infection also. I may be permitted to add that this detailed study has the supplementary evidence of a long observation in patients whose stools and blood were examined as a routine practice.

But while the above facts were being disclosed, other cases presented themselves with histories of a number of attacks of malaria and, often with positive blood findings, in whose stools the examination showed an average uncinarial infection present also, but their hæmoglobin estimates reached no such degree of anæmia as noted above. This fact required some other factor than uncinarial infection in the etiology to explain this discrepancy. This factor I think I have ascertained to be poor food; food poor in protein value, with a great deal of coarse fibrous stuff which requires large quantities to be ingested to meet the bodily needs. To illustrate: In the report of the Porto Rico Anæmia Commission [11], Ashford found among the hill people a very grave anæmia due to uncinarial infection. This anæmia reached such an extreme degree that the average hæmoglobin value was 40 per cent., with red blood corpuscle counts averaging about 2,500,000 per cubic millimetre of blood. According to Ashford, malaria here was a very small factor in the causation of this anæmia. The poverty of these people in addition was extreme. They were unable to procure any kinds of food except such as grew around them—such food for instance as I have already described for the natives of Panama; but sometimes in periods of financial distress their food was limited largely to bananas and black coffee. On the other hand, here on Taboga Island, in a people who are very similar in race to the hill people of Porto Rico, but in a very much better financial state than that described by Ashford for the Porto Ricans, I found in 104 estimates that the hæmoglobin value averaged 66 per cent. Malaria in Taboga played a considerable part in the causation of the anæmia. There were four cases in this series who harboured malarial parasites at the time of the examination. Fourteen others stated that they had "fever" at one time or another in their lives; but parasites could not be demonstrated in the examination of their peripheral blood. Splenic enlargement was present in all the cases with a malarial history, but the largest spleen was only 20 cm. in its greatest diameter. Uncinarial infection was demonstrated in 88 per cent. of sixty-two stool specimens examined. Some of these infections were very severe. The lowest hæmoglobin value found in this series of estimates in the non-malarial cases was 25 per cent., while in the malarial cases it was as low as 10 or 12 per cent. The food of these people can be stated as fair in protein value, that is, while it consisted principally of the usual tropical foods, they had beef, fowl, and a plentiful supply of fish.

Here then I have been able to compare similar peoples living under similar conditions with regard to the exposure to uncinarial infection—the one extremely poor, the other fairly well-to-do for the Tropics—in which comparison it is shown that the average hæmoglobin value of the very poor is 40 per cent., while in the fairly well-to-do it is 66 per cent., or 26 per cent. more in favour of the fairly well-to-do, and this in spite of the fact that 18 people in the

fairly well-to-do—or 17 per cent.—showed evidence of previous attacks of malaria. I think then I may conclude that food alone, that is poor food, must be reckoned as one of the principal factors in the causation of the grave secondary anæmias of the Tropics, and it also explains the discrepancies already alluded to in cases with both uncinarial infection and chronic malaria in the same individual, in which some show an extreme degree of anæmia, while others average up and around 70 per cent., or sometimes even above.

These findings are in harmony with the observations of Marchiafava and Bignami [13] where they state that this condition of anæmia does not occur in patients whose diet is good, and who are not subjected to excessive fatigue, or who live under good hygienic surroundings. They are also in harmony with Mannaberg's [14] observations when speaking of malaria cachexia, where he stated "it is almost always the very poor and the miserable, who live under bad hygienic conditions, that become its victims."

As I have already stated, all writers describe a malarial anæmia which may persist even after the attacks of fever have ceased under treatment. Marchiafava and Bignami [15] call attention to an anæmia that not only persists after the malarial attacks are cured, but tends to progressively increase, "*post malarial anæmia.*" While they suggest another factor "at present unknown" as a cause of the progressive anæmia, they offer, however, as a possible explanation the exhaustion of the hæmatopoietic organs, notably the bone marrow, from long and continued attacks of malaria. This explanation is plausible enough, but I shall show later that exhaustion of the hæmatopoietic organs is not the cause. For in all my severe anæmias, as soon as the patients were rid of their uncinaria there was a decided and satisfactory gain in the patient's general condition, and a rise in the hæmoglobin and red cells. The red cells usually share in this gain, as was seen in the secondary anæmias of malaria, in greater proportion than the hæmoglobin. Thus, in the worst case of my series, whose hæmoglobin value registered 13 per cent., and whose red corpuscle count was 850,000 per cubic millimetre, after the recovery of 896 uncinarial worms the hæmoglobin value at the end of six months registered 55 per cent., while the red cell count was 4,336,000 per cubic millimetre, with a colour index of '63. In another case whose hæmoglobin value registered 54 per cent., and whose red cell count was 2,704,000 per cubic millimetre, with a colour index of '99, after the recovery of 68 uncinarial worms his hæmoglobin value increased to 90 per cent., and his red cell count to 4,760,000 per cubic millimetre, with a colour index of '93, within a period of fifty-five days. All the other cases responded with equal promptitude after treatment for their uncinarial infection. Hence it must be accepted, that if a patient in the conditions cited for the first case in my series can recover, and reproduce red cells to 4,336,000 per cubic millimetre, there is no exhaustion of the hæmatopoietic organs. And it is then necessary to conclude that Marchiafava and Bignami were studying cases in which the unknown factor to which they allude was most probably uncinarial infection, as it is now well known that Italy is infested with this pest as well as other warm countries.

As herein set forth, I have shown that after acute initial attacks of malarial fever the loss of hæmoglobin and the reduction of the red blood cells is rapid. The loss of hæmoglobin in two or three months of irregular fever may take place to an amount of 40 to 50 per cent. of the normal, and the red cells share this loss to the extent of from 2,000,000 to 2,500,000 per cubic millimetre. After the attack is cut short by treatment the recovery of these elements of the blood is also rapid. In uncomplicated malaria in repeated attacks extending over a period of from three to six years, which may with propriety be termed chronic, the loss of hæmoglobin and the reduction of the red cells, as I have shown, not only cease, but tend to increase almost or quite to normal; and this in spite of repeated recurrences of fever. In the grave secondary anæmias there are other factors which enter into their causation besides malaria. These are, first, uncinarial infection; and second, a state of semi-starvation, not always on account of the quantity of food, but on account of its poor value.

Therefore, with uncinarial infection and poor food made to bear their due share in the cause of the grave secondary anæmias in malarial subjects in tropical and other malarious countries, and with kala-azar as now excluded, I may conclude that there is no such thing as a grave malarial anæmia persisting over a long period of time, to finally terminate in a distinct entity, *malarial cachexia. The term malarial cachexia is misleading, and serves only to misdirect one's efforts toward alleviating this truly pitiable state, and it ought to be abandoned in medical nomenclature.*

[I wish to thank Colonel Gorgas, Chief Sanitary Officer, Isthmian Canal Commission, for his permission to publish this paper.]

BIBLIOGRAPHY.

[1] ROWLEY-LAWSON. "The Cause of Malarial Anæmia and the Intravascular Migration of the Malarial Parasites," *Archives of Internal Medicine*, vol. ix, No. 4, April 15, 1912, p. 420.

[2] MARCHIAFAVA and BIGNAMI. "Malarial Fever," *Twentieth Century Practice of Medicine*, vol. xix, 1902, p. 192.

[3] *Idem.*

[4] Cited by MARCHIAFAVA and BIGNAMI. *Loc. cit.*

[5] Cited by SCHEUBE. "Diseases of Warm Countries," second edition, p. 429.

[6] Cited by MARCHIAFAVA and BIGNAMI. *Loc. cit.*

[7] BREM and ZEILER. "A Study of the Hæmoglobin of Coloured Labourers in Panama," *Archives of Internal Medicine*, June, 1910, p. 569.

[8] "A Study of Secondary Anæmia in Panama," *The Journal A.M.A.*, vol. lviii, January 27, 1912, pp. 268-272.

[9] Cited by MARCHIAFAVA and BIGNAMI. *Loc. cit.*

[10] DARLING, SAMUEL T. "Studies in Relation to Malaria," Public Doc. Isthmian Canal Commission, Laboratory of the Board of Health Dept. Sanit., 1910.

[11] *Loc. cit.*

[12] ASHFORD and IGARAVIDEZ. "Report of the Porto Rico Anæmia Commission Senate," December, No. 808, pp. 12, 13, 17.

[13] MARCHIAFAVA and BIGNAMI. *Loc. cit.*

[14] MANNABERG, J. "Malarial Fever," "Encyclopædia of Practical Medicine," 1905, p. 350.

[15] MARCHIAFAVA and BIGNAMI. *Loc. cit.*

WEST AFRICAN NOTES.

By Henry Strachan, C.M G., F.L.S., F.Z.S., F.R.A.I., &c.
Late Principal Medical Officer of Southern Nigeria.

(1) Note on a Portable Insect-proof Room.

In view of the number of diseases dependent on insect carriers in the Tropics—particularly in West Africa—a portable, efficient, and inexpensive insect-proof room, not only for sleeping, but for dining and working in, in the late hours of the day and during the night, is almost a necessity for those who have to travel and work in such regions.

For some years I made shift with such a room constructed of mosquito netting, but the frequent injuries which occurred to such a flimsy structure rendered it very soon practically useless. I, however, designed a portable insect-proof room which I used on a recent visit to West Africa with perfect satisfaction.

It is necessary that such a building should be (*a*) thoroughly efficient for the purpose for which it is intended; (*b*) capable of being rapidly put together and taken apart; and (*c*) of such moderate cost as to allow its advantages to be available to the great majority of those whose work renders such a protection necessary for the preservation of health and life in tropical regions.

The main feature of my portable insect-proof room is that it is constructed of "sectional units," which are panels of mosquito-proof gauze, 7 ft. long by 3½ ft. wide. The woodwork is painted with "solignum," a material which is repugnant to the attacks of white ants. At one end is a door with a strong spring to close it. My own room was 17½ ft. long, and, of course, 7 ft. broad, and 7 ft. high. This was divided by a transverse curtain; one room containing bed, table, and chair, while the other comfortably contained a small writing-table, and chairs. There was also ample room for small, and for valuable, articles of baggage. Over the bed-room was stretched my tent, and over the front, or sitting-room, the fly of the tent. All of this was erected in a shed or hut of native workmanship, with palm-leaf thatched roof and walls, the roof being some 6 ft. above the top of the room, and the walls 5 ft. from the sides, thus allowing trunks, stores, &c., to be under cover at the sides, while the end made a good bathroom. The gauze being of No. 16 hole (which I some years ago pointed out prevents the passage of even the smallest mosquito—an observation which, by the way, has been independently recently confirmed by Dr. H. Seidelin), admits the maximum of light and air, and is far more comfortable to the occupant than the smaller-meshed gauzes which have been popular for anti-mosquito work. The absence of the hot "stuffy" mosquito-net was a very great comfort at night.

Not only did I benefit by the fact that mosquitoes, tsetse-flies (*Glossina palpalis* chiefly), which abounded, and the common, filthy house-fly, which swarmed in myriads, were kept out, but also by the fact that "winged ants" (termites, &c.), moths, and other insects were prevented after lamp-light from interrupting meals and writing.

The room was constructed for me by Messrs. Conner and Sons, builders, 263, Lewisham High Road, S.E., to my complete satisfaction.

I am so convinced as to the great comfort and the protection from illness which are afforded by such a portable insect-proof room to all Europeans who have to work in tropical regions, either as explorers, surveyors, and engineers (engaged in railway or waterworks, or in mines), as well as to political officers travelling on tours of inspection, that I bring the above facts to their notice.

(2) Notes on the Bites of the Tsetse-fly (*Glossina palpalis*).

The following observations by one who has been bitten frequently by *Glossina palpalis* may be of some little interest.

The attack of the fly varied strangely. It was sometimes accompanied by a loud buzz and violent impact, with a sharp and painful stab. At others it was so silent and painless that I (on two or three occasions) only by chance saw the fly gorging itself on one hand (when I was able to capture it with the fingers of the other hand), and it not infrequently happened that only the discovery that blood was staining the site of the puncture revealed the fact that one had been bitten. In all cases, however, very soon the puncture was surrounded by a weal, sometimes as large as a threepenny-bit, which was painful and itching for several minutes.

I have been bitten by *G. palpalis* as far as, or a little beyond, a quarter of a mile from a river.

The flies bite most viciously during the heat of the day.

There was no sleeping sickness known to exist in the area where I was bitten in Southern Nigeria, but it was said that cases had occurred some thirty or forty miles north of that place.

It is obvious that there is grave danger of the disease gradually extending southward along the river valleys. It is noteworthy that the only cases which came to notice in the Western (Yoruba) Province of Southern Nigeria had been infected in other countries (such as Fernando Po, Congo, &c.), and that although *Glossina palpalis* abounds in the Western Province, and trypanosomiasis of horses and cattle is common, there appeared to be no instance of infection from the few immigrant cases (of sleeping sickness) which were detected by the Medical Department in the Western Province during the fourteen years that I was there as Principal Medical Officer.

"South African Medical Record," May 24, 1913.

Leprosy.—The above number is devoted chiefly to the subject of leprosy. There is a leading article on the subject; then a very interesting paper on the "History of Leprosy in South Africa up to the establishment of the first Leper Asylum at Hemel en Aarde," by Dr. Morrow; then another paper on "The Administrative Side of the Leprosy Question," by Dr. Murray; and, finally, the "Report of the Government Research Pathologist on Leprosy for 1913," by Dr. Bayon. (All these papers are worthy of study.)

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CHILDREN IN CHINA.

THAT the Chinese understand how to successfully bring up their children would appear to be evident seeing the enormous multitude of the population which inhabit the central provinces of China—a population numbering somewhere about 400,000,000, wellnigh a quarter of the human race; although, however, the people swarm in number the infantile death-rate is not small. The fact that there are practically no unmarried men or women in China helps to explain the large number of children born, and because polygamy is practised almost all women become mothers even should the female population outnumber the male. Loss of men in war, in dangerous occupations in times of peace, such as in factories, mines, at sea, or on railways, &c., is soon made up in countries where polygamy prevails, but it takes a generation or two in non-polygamous countries to make good the severe losses of men in war, &c.

In China, mothers wellnigh invariably suckle their children, and the period of lactation is often continued for fifteen to twenty months or more. Lactation continued for so long a period would also tend to limit the population were it not for polygamy. In dealing therefore with the numbers of population in polygamous countries these facts must be taken into account.

Infants in China being breast-fed the question of rearing children by other methods would scarcely appear to require consideration. Yet this is not so, for Chinese children from the earliest period of their existence have their natural food supplemented by rice in some form.

Cow's milk is not used as a substitute for mother's milk; for cow's milk is not an article of diet in China. There are few cattle of any kind in China and cow's milk is considered very rationally as fit only for calves, and not for human beings. Buffalo milk is more often met with; it is seldom used, however, as milk, but is made into curd or a kind of cream cheese. Instead of milk, rice in the form of rice water or rice congée (soft boiled rice in which both the rice water and the softened rice grains are present) is given to children as a supplement to their natural food. One may see a Chinese mother feeding her week-old baby with soft boiled rice, or rice which she herself has chewed, and thereby moistened and softened. The effect upon the infant's stomach is very patent to behold, for the distension at times becomes extensive; one would expect the infant's digestion to be upset thereby, and it not infrequently ensues, for "infantile diarrhœa" is one of the commonest causes of infant mortality. Rice water is an excellent substitute for milk, but chewed or soft boiled rice is calculated to, and actually does, upset the child. Rice water, that is, the water rice is boiled in (and given after the particles of the rice are removed by straining), is an excellent substitute for milk, and especially in cases in which neither the mother's milk nor cow's milk is tolerated. Rice water does not curdle in the stomach, and is therefore free from the evil consequences of milk clotting in a stomach which is irritated from any cause. European children in the Tropics when the gastro-intestinal tract is irritated or inflamed, and infantile diarrhœa is present, do well on rice water as a temporary substitute for cow's milk.

A common cause of intestinal ailments in children in China, especially South China—that is, the districts south of the Yang-tse river—is the presence of round worms. Children, whether Chinese or European, as young as seven months old, may have round worms in plenty, and consequent intestinal flux, with at times mucus and blood alternating with obstinate constipation, is a common cause of death in quite young children.

Trismus nascentium or neonatorum—the lock-jaw of newly-born infants, which so long remained a mystery as to its cause, has proved a scourge in many parts. The infection is by way of the umbilical cord; the soiled string and cloth with which the navel is tied and dressed, or the nurse's hands and clothing, convey the infection, and the disease showing itself on the fourth to sixth day causes a fatal issue by the tenth or twelfth day. Nor do European children escape; the writer was witness of a European child nursed by a European monthly nurse dying, on the tenth day, of trismus; the nurse came from a local convent where trismus was endemic, and conveyed the infection to the European infant.

One great conservative factor in infant life in China is the fact that the mother carries her child on her back; the child is thereby prevented becoming chilled, and an equable temperature by contact with the mother's body is constantly maintained. In Britain the mother or nurse used to carry the child on the arm with a shawl wrapped round her body and the child; an equable temperature being thus kept up. The child was thereby prevented being overheated as happens to-day when a hot water

bottle is put into perambulators in cold weather, to be followed by a state of cold and chill when the hot water cools. The perambulator has proved a source of illness in many ways in this country, and its most recent pattern, a chair on wheels without protection from wet or cold, is the most detrimental carriage conceivable. The Chinese, in common with all Oriental peoples, have as yet avoided the perambulator, but the modern ways of the West are penetrating the East in every direction; let us hope that this racial destroyer may be shunned and avoided by rejuvenated China.

The " comforter " has not as yet found its way into China, hence we seldom meet with adenoids and the various oral, dental, aural, and thoracic deformities which came in with the use of the comforter, and will remain with us until the comforter is prohibited by law.

The mortality due to the widely reported destruction of female children when these are " not wanted " is a wholly negligible quantity. No race of people cherish children more than the Chinese. Their desire for, and fondness of, children is proverbial, and cruelty to children is unknown. That children are often " found drowned " in harbours and rivers is a fact, but when it is remembered that the boat population of China numbers some ten millions accidents to children can be readily understood. The boat population actually live on the boats; they have no shore habitation, but the family has its being from generation to generation on the boats. Finding a drowned child now and again therefore cannot be wondered at, and foreigners are apt all too often to ascribe what is an accident to design.

Scarlatina in Southern China is unknown, but not infrequently met with in the North. Measles in the South is quite rare, but is prevalent in the North of China. Diphtheria occurs for the most part in sporadic form, seldom in epidemics. Rheumatic fever in the South of China is practically unknown amongst either Chinese or Europeans.

Small-pox is a great scourge in China, and every Chinese expects to have the disease at some time. The mortality from small-pox is very great, in spite of attempts at inoculation and of vaccination. Except at some of the coast ports where European methods obtain vaccination is extremely limited.

Enteric is probably universal, and it is possible that every Chinese child has an attack rendering it immune in adult years. That the Chinese have recognized this is evident from the fact that they do not drink water unless boiled in the form of tea, and as the Chinese make tea it may be and is taken freely at any time, and even given to children without apparent harm. Tuberculosis in all its forms prevails in China to perhaps a greater extent than in any other country; the introduction of opium smoking was probably due to the presence of pulmonary tuberculosis with its attendant cough, which opium smoking helps to allay.

J. C.

Abstract.

PROTECTIVE INOCULATION AGAINST CHOLERA.*

By W. M. Haffkine.

(*Continued from p. 207.*)

PART II.—Immunization of Man against Cholera.

The Nature of the Problem.

The foregoing explanations refer to the preparation of a stable cholera virus of given strength and to the study of its immunizing effect on the lower animals, which, under ordinary conditions, enjoy natural immunity from the disease. Special research of a different nature is obviously required in order to find out whether the same or another virus may be efficient in immunizing man against the disease which affects him specifically, and, indeed, whether immunization of man against cholera is realizable at all.

When Haffkine undertook the study of the matter scientific and medical authorities were divided on the latter question; or, perhaps, the balance of opinion was in favour of a negative reply. The effect, which the results of the inoculations in Spain, in 1885, had on the views of the Russian authorities have been mentioned in Part I. In India observers were impressed with the fact that cholera had been known to recur in persons who had previously suffered from the disease, and who seemingly had not benefited by what should be a highly efficient course of immunization. Others considered that the comma bacilli which served for the preparation of the vaccine were not the primary cause of cholera, but only a harmful concomitant of it, and that consequently the vaccine could not affect man's susceptibility to a cholera attack, though it might affect the rate of recovery from such attack.

Among authorities in Europe, Pfeiffer and Wassermann, Sobernheim, Metchnikoff, Zabolotny, and others held immunization against intestinal cholera impossible, or at least very unlikely, both on grounds of theoretical consideration and on the result of laboratory experiments on animals and man. Metchnikoff aptly summarized the views then prevailing in the following passage:—

" As we have seen, intestinal cholera of rabbits is an intoxication by the poisons prepared in the digestive canal. Now, it has been shown in several investigations that vaccination does not protect against poisoning of the organism. One can, therefore, easily conceive *a priori* that an animal, very well vaccinated against the cholera vibrio introduced into the tissues, may not resist intoxication by a poison manufactured in the intestinal contents. The experiments described in the preceding chapter have given a result which accords with the view of authors who conclude that vaccination by live or sterilized cultures against intestinal cholera pro-

* Calcutta: Thacker, Spink and Co. London: W. Thacker and Co., 2, Creed Lane, 1913.

duced by Koch's method is ineffectual. In the memoir in which they treat this subject, Pfeiffer and Wassermann come to the same conclusion as regards the prevention of this experimental disease by means of a very active serum, obtained from a person who recovered from cholera. While very weak doses of that fluid sufficed for preventing choleraic peritonitis in guinea-pigs, considerable quantities (up to 5 c.c.) were powerless to vaccinate these animals against infection by Koch's method."

Metchnikoff had also been led to the above view in another way, namely, by the result of an experiment on two men whom Haffkine had inoculated against cholera in Paris in 1892, from six to seven months previously, and whom, on his departure for India, he had occasion to submit to an artificial infection, by the mouth, with measured doses of cholera virus. The result of the experiment appeared to be as follows:—

"Haffkine's subcutaneous vaccinations, done six and a half months before the experiment, did not prevent, therefore, either the diarrhœic effect of the cholera vibrios, or the causation of a condition of general malaise. . . . If the two persons inoculated with Haffkine's vaccines had less diarrhœa, they experienced a pronounced general malaise, which was absent in a non-inoculated individual. Of the two persons who underwent Haffkine's vaccinations, the one who had been vaccinated twice was more affected by the vibrios than the other, who was vaccinated only once.

"As in the old experiments of Ferrán's, it is in no way possible to consider as proved that hypodermic inoculations of vibrios prevent the action of those microbes when they are introduced in the digestive canal."

The Plan of Research in the Indian Epidemic Areas.

It was thus of essential importance to investigate first the above question of principle, that is to say, to find out whether cholera immunization of man was possible at all; and for this reason, throughout the author's studies in India of 1893-96, he employed the most promising form of vaccine which he could evolve, irrespective of the amount of labour and technical difficulties which this implied; and such a preparation was considered *vaccine "II" in a live condition.* Haffkine had already worked out then and used on animals and man, as is stated in various publications of the time, the *devitalized* form of that vaccine, namely, the form which, lately, has not unfrequently been referred to as Kolle's vaccine; but he held the live variety to be by far the more reliable, and this from two points of view: on account of its immunizing power and of the duration of immunity likely to result from it. The latter point was an essential one, as it was not known how long an interval of time would elapse between the date of inoculation and the occurrence of an epidemic in which the immunity of the inoculated was to be put to the test, a consideration the significance of which appeared clearly in the events which afterwards took place in India. The superiority of immunization by *live* vaccine became apparent early in laboratory experiments, and the fact of this superiority has been confirmed, during the last ten years, by experimentalists working on various diseases, namely, in plague, by Kolle, Otto and Strong; in typhoid, by Vincent, Metchnikoff and Besredka; and so on.

In the course of the years 1892 to 1895, Haffkine studied the effects of the above-described two live vaccines and inoculated, first, himself and a number of his personal friends, so that the reaction produced by the injection could be carefully observed, and its harmlessness established. Then he extended the operation to 42,197 persons inhabiting ninety-eight different localities in India, viz., in Bengal, Behar, the then North-Western Provinces and Oudh, the Punjab, the Brahmaputra Valley, and Lower Assam. In 1895-96 he inoculated a further 30,000 people in Bengal, Behar, Assam, the Central Provinces and the Bombay Presidency. It was necessary to spread the inoculations in this manner, as it was not known exactly where cholera outbreaks might occur, while in some of the localities most threatened with outbreaks, namely, in Bengal—where were subsequently carried out the most instructive of Haffkine's operations—he was unable, for a considerable time, to obtain assent to his work. Efforts were directed to inoculating people under such conditions as would afterwards render possible an accurate study of results. In this manner part of the officers, non-commissioned officers and men in sixty-four British and native regiments were inoculated; a proportion of the coolie population in forty-five tea estates in Assam, Cachár, Sylhet and the Chittagong district; part of the inmates of boarding schools and orphanages and of nine civil jails; the population of a supervised village of Sansis (one of the criminal tribes) near Sialkot, Punjab; inhabitants of Himalayan villages situated along the Hardwar pilgrim route, between Naini Tal and Mussoorie, and liable to become infected with cholera; residents of the suburban quarters (*bustees*) of Calcutta, and so on. Elaborate arrangements were made among these communities for recording cholera occurrences for a certain period to come; and by 1896 a mass of material was collected.

Some of the Difficulties of the Research.

It will be easily understood that it was not in all parts of India that the author was able to obtain the precise conditions necessary for his work. In a statement which he made at the First Indian Medical Congress in Calcutta, at the end of 1894, twenty-one months after the commencement of his operations in the country, concerning one point which caused him special anxiety, he said:—

"I could not carry with me a laboratory. It was most fortunate for my work that a short time before my arrival in India, the Government of the North-Western Provinces and Oudh decided to found a bacteriological establishment in that part of the country, and entrusted it to the able direction

of Mr. Hankin. He and his laboratory were of the greatest help to me during the whole time of my work in the upper part of India. But great as was this assistance, it was far from being sufficient. I have mentioned already the great variations which the cholera virus undergoes when cultivated in the laboratory. For keeping it in the required state, it is necessary to pass it constantly through animals, in the same way as vaccine lymph must always be taken fresh from a calf or a child, if one wants to have it at its full power. It is sufficient to say that, when I came from Calcutta to Agra for the first time, I was able to procure and bring with me only six of the required animals. The most essential part of my method, which forms its distinguishing feature, could only be carried out, during the whole time of my nomadic operations in the country, in a most unsatisfactory manner.".

Nevertheless, the results obtained, though varying in direct relation to the variety of vaccine employed, the duration of the particular epidemics and the lapse of time between the date of inoculation and the date of exposure to cholera infection, *all* pointed to the fact that effective protection was conferred by the operation, as will be detailed presently.

Safeguards adopted for securing Accuracy of Results.

The arrangements for a systematic study of the subject culminated in a special organization made in Calcutta, where elaborate machinery for the purpose, under the then Health Officer, W. J. R. Simpson, was kept in operation for thirty-three months. The facts brought to light in that city coincided accurately with those observed in *all other parts of India*, and may be said to form the basis of knowledge on the immunization of man against natural cholera. In view of this circumstance it is, perhaps, desirable to mention the particulars of the arrangements by means of which the results were gathered, and the safeguards adopted for securing accuracy. The statement may be the more opportune as the question of anti-cholera inoculation has been coming up lately for animated discussion, and the precise details of the Indian studies, which were consigned mostly to special reports and publications, are perhaps not sufficiently known.

The information as regards the arrangements in Calcutta is given in the report submitted by the Health Officer, on July 1, 1896, to the Chairman of the Municipal Corporation concerning the first twenty-four months of the observations in that city. The details of the service which was employed in the work, and which formed part of the Municipal Health Office, are described in the report thus:—

"The following records of the inoculations are kept in the Health Office:—

"(1) A daily register filled up at the time of inoculation, containing name, father's name, sex, age, caste, occupation, residence and place of inoculation; also any relative who may have been inoculated.

"(2) An alphabetical register containing the names of the inoculated with the above details, so that ready reference can be made as to whether a person attacked with cholera has been inoculated.

"(3) A ward register showing the residences of the inoculated people, so that when any particular locality is affected with cholera, the inoculated in that locality may be easily found.

"Cases of cholera are notified to the Municipal Office by the following agencies: the registrars of births and deaths of each of the wards; the sub-registrars at the burning ghats and burial grounds; the authorities of the local hospitals, jails and the fort; the police; the medical practitioners who are asked, in conformity with the Municipal law, to notify all cases of cholera on special postcards with which they are provided; and by officers of the Health Department. All notified cases are immediately subjected to an inquiry by the Medical Inspector in charge of the district, who has personally to visit the house and take the necessary precautionary measures to prevent the spread of the disease. In his inquiry as to the circumstances of the attack, he has to fill up a printed form embodying the necessary information; and one of the questions, since the introduction of the inoculation, is whether there are any inoculated people in the house, and whether the attacked person was inoculated or not. This information is at once communicated to the Health Office; and when the case occurs in a house where inoculated people live, the Medical Officer in Charge of the Inoculations immediately visits the house, accompanied by the Medical Inspector of the district, and makes a thorough investigation as to the particulars of inoculated and uninoculated inmates and the incidence of cholera on these respectively. The accuracy of the statement as to who is inoculated is checked by the inoculation registers, which have already been referred to. A list of these cases is given to the Health Officer who periodically visits the cases and verifies the results.

"On two occasions the results have been subjected to a further scrutiny. In July, 1895, when the number of houses in which observations had been made was thirty-six, Haffkine re-visited with me" (W. J. R. Simpson) "ten of the most important, which he had not previously seen, and satisfied himself that the returns were absolutely accurate. He would have seen all, but he was not well at the time. And quite recently, during my absence in England, Surgeon-Captain Robson Scott, I.M.S., Deputy Sanitary Commissioner of the Presidency Circle, made a special investigation on the subject, which lasted several weeks. Dr. Mookerjee and Dr. Chowdry, of the Municipal Medical Service, were specially deputed to assist him in his inquiry, and the local Medical Inspectors were asked to give him every assistance. The inquiry consisted in visiting affected localities and those in which inoculation had been carried out, and in collecting information from the members of the households and neighbours, which, on being brought to the Health Office, was checked by the inoculation registers

and by the cholera death registers. The result of this investigation confirmed the accuracy of the previous observations, and Surgeon-Captain Robson Scott has furnished me with the following note:—

"'In compliance with your request of yesterday, I now send you a short account of my visits to the bustees in Calcutta during last May.

"'In the beginning of last May, M. Haffkine asked me to visit those wards in the town in which anti-choleraic inoculation has been performed on the inhabitants, with the view of testing the accuracy of already recorded observations, and to try and find out if any observations had been missed.

"'During the eleven afternoons or mornings that were devoted to the work, fourteen wards were visited, and inquiries were made in 164 different bustees and houses. I was either accompanied by a Medical Inspector or by the Town Inoculator (Dr. Chowdry), and was taken by him to the various quarters where inoculation had been carried out.

"'First of all I found out from the inhabitants those dwellings in which cholera had broken out; and afterwards the individual residents in those particular dwellings were questioned, and their statements taken down by me.

"'I have been able to convince myself that the method of recording the observations in Calcutta is most satisfactory, and that the recorded observations are correctly stated.

"'I intend to continue these visits to the bustees in Calcutta from time to time, and I shall be glad to furnish you with any new information I may gain.'"

Results of the Studies on Man exposed to Cholera Infection.

From the end of March, 1894, to the end of December, 1896, 7,908 people were inoculated in Calcutta, mostly in the cholera-stricken suburbs. The disease visited subsequently eighty-five of the houses in which inoculated persons lived, and one of the ships in the harbour, the *Majestic*, part of the crew of which had been inoculated. The total number of inhabitants in these houses and on the ship was 1,395. The details are embodied in a series of tables which comprise the addresses, the number of inoculated members in each house and on the ship, and the date of their inoculation; the number of non-inoculated members; the name, sex, age and caste of the individual or individuals attacked with cholera, and a statement as to whether the attacked had been previously inoculated or not, and, if inoculated, whether with preparatory vaccine only, *i.e.*, vaccine "I," or with vaccines "I" and "II"; the date of attack and the interval which had elapsed between the date of inoculation in that particular house, or on the ship, and the date of the cholera occurrence; and a statement as to recovery, or, in the event of death, the date of this. Only one instance of failure in a patient inoculated with the two vaccines was observed, the attack in that case occurring 688 days after the date of inoculation.

A list of a series of cases is then given in tabular form.

The details of the inoculations performed during the month and all occurrences of cholera in houses where inoculated individuals lived were published as the events were taking place in a special inoculation bulletin. The information included all the details summarized in the tables mentioned. In this manner the medical and sanitary authorities and the medical practitioners of Calcutta, of whom many were keen critics of the method, were kept informed of the progress of the work and placed in a position to verify the facts. Further, throughout the period of investigation detailed reports, showing the occurrences of cholera in households containing inoculated members, were submitted periodically to the Municipal Council of Calcutta, at whose expense the inoculation service was maintained. The Council includes, as is well known, a high grade Government officer, a member of the Civil Service, as Chairman; officials of the Government of Bengal; lawyers; officers of the Indian Medical Service and medical practitioners; newspaper proprietors and editors; house and landowners; members of European and Indian mercantile and trading firms, &c.—who represent and reside in each of the localities referred to in the tables. The Municipal Commissioners were thus enabled to control the statements embodied in the reports. The facts and the whole inoculation system were challenged whenever a Commissioner had doubts about them; questions were put officially to the Chairman of the Municipal Corporation; the matter was debated publicly in the Corporation meetings, of which reports appeared in the daily press and in the medical papers; and a detailed re-investigation was on each such occasion made. In the course of these re-investigations a few errors were discovered and corrected.

Had it appeared at any time that the study was being impaired by inadequate investigation, by exaggerating the results or by minimizing cases of failure, or by any other manifestation of carelessness or of bad faith, the progress of the work would have been at once arrested, as it depended wholly on the confidence which the public and the authorities had in the operators.

Another table in the report at once reveals the fact that the incidence of cholera among the inoculated varied according to three periods. During the first four days after the date of inoculation cases were observed both among the inoculated and the non-inoculated; after the first four days there was a period of nearly fourteen months (412 days) in which three attacks occurred among the inoculated, while among the non-inoculated, in the same houses, cases were taking place at short intervals throughout the whole of that period; and from the 417th day, during the remaining thirteen months of observation, cases reappeared among the inoculated. As time went on the field of observation gradually contracted owing to the usual migration of the occupants of suburban tenements.

Analysing his tables according to the above three periods, Haffkine states that:—

(1) In twelve houses and on the ship *Majestic* where cases of cholera occurred during the first four days after inoculation—a period in which the protective effect of the vaccine gradually asserted itself—there lived a total of 123 non-inoculated individuals, who had six cholera deaths (4·88 per cent.) and four attacks ending in recovery, and 142 inoculated, who had five deaths (3·52 per cent.) and one attack with recovery.

(2) In the fifty-four houses where cholera occurred during the second period, extending over fourteen months, *i.e.*, from the fifth to the 416th day after inoculation, there lived 539 non-inoculated, who had sixty-one deaths (11·32 per cent.) and five attacks ending in recovery; and 279 inoculated who had two deaths (0·72 per cent.) and one attack with recovery.

(3) Lastly, in the sixteen houses where cholera occurred during the third period, *i.e.*, between the 417th and 800th day after inoculation, there were 126 non-inoculated, who had fifteen deaths (11·90 per cent.) and two attacks with recovery, and forty-one inoculated who had six deaths (14·63 per cent.).

During the immunization period, which occupied four days, the number of deaths among the inoculated was, therefore, 1·39 times smaller than among the non-inoculated. During the period of immunity, lasting 412 days, the number of deaths among the inoculated was 15·79 times smaller than among the non-inoculated; which is to say that of every 100 deaths from cholera, which were to take place in that period of 412 days, ninety-four could be averted by the use of the vaccine. Lastly, during the third period, from the 417th to the 800th day after inoculation, when the effects of the immunization had vanished, the number of deaths among the non-inoculated was 1·23 times smaller than among the inoculated.

Of the six inoculated belonging to the last group, who were attacked more than 416 days after inoculation, five had received only one injection, with the first, or preparatory, vaccine; and the sixth, inoculated on May 29 and June 3, 1894, and attacked with cholera on April 16, 1896, 688 days after the first inoculation, had had the two vaccines in very weak doses, as was practised before the date of the observations made in July and August, 1894, in the East Lancashire Regiment, at Lucknow. It was the latter observations that indicated for the first time at what rate the effect of the doses with which the inoculations had been commenced in India tended to disappear as time went on. Since the summer of 1894 the doses and the strength of the vaccine were increased, with the object of extending, if possible, the duration of immunity, as will be stated lower down.

The results observed throughout the rest of the country agreed in every instance with and confirmed the Calcutta observations.

In the 1st Battalion East Lancashire Regiment inoculation was carried out in May, 1893, soon after Haffkine had begun work in India, and cholera, in a severe form, broke out in July and continued in August, 1894, that is, during the fourteenth and fifteenth month after the date of inoculation.

Among 640 non-inoculated officers, non-commissioned officers and men there occurred 120 cases (18·75 per cent.) with seventy-nine deaths (12·34 per cent.); and among the 133 inoculated, eighteen cases (13·53 per cent.) with thirteen deaths (9·77 per cent.). The inoculation had been done with vaccines " I " and " II " given in very small doses.

Among the British troops at Cawnpore, in July and August, 1894, thirteen months after inoculation, there occurred, among 797 non-inoculated, nineteen cases with thirteen deaths, and among seventy-five inoculated, no cases. Inoculation in this regiment had been done by Mr. E. H. Hankin, of Agra.

In the 2nd Battalion Manchester Regiment, at Dinapore and Camp Beta, in July-August, 1894, a few cases occurred two to six days after inoculation, viz.:—

Among 729 non-inoculated, six cases with three deaths, and among 193 inoculated, no cases.

On the tea estates in Lower Assam, viz., Kalacherra, Chargola, Pollarbund and Lungla, there occurred in the summer of 1895, during the first few weeks after inoculation, among 4,747 non-inoculated coolies, twelve cases (0·25 per cent.) with nine deaths (0·19 per cent.), and among 1,374 inoculated, all with vaccine " I " only, one case (0·07), fatal.

On one estate only, at Adam Tila, 657 non-inoculated remained free from cholera, while among the 318 inoculated, all with the preliminary vaccine only, there occurred two cases (0·63 per cent.) with one fatal issue (0·31 per cent.).

In the Gya Jail inoculation—first with vaccine " I," and five days later with vaccine " II," both in small doses—was applied in July, 1894, while an epidemic of cholera was in progress. In the fifteen days during which the epidemic continued, and including the cases which occurred during the first days, *i.e.*, while the protective effect of the vaccines was still asserting itself, there were, among a daily average strength of 202 non-inoculated prisoners, twenty cases (9·91 per cent.) with ten deaths (4·95 per cent.); and among a daily average of 208 inoculated, eight cases (3·85 per cent.) with five deaths (2·40 per cent.). Of the five fatal attacks, four occurred within four days after the first inoculation, before the second inoculation was done, and the fifth in a prisoner who had both the preparatory vaccine and the vaccine proper.

In the Durbhanga Jail, in April, 1896, inoculation was applied, similarly, during the progress of an epidemic, but this time one injection only, with vaccine " II," in strong doses, was given from the first. The prisoners had been told to seat themselves on the ground in rows, and every second man or woman, as they happened to have placed themselves, was inoculated. After the time of inoculation the epidemic lasted only five days, but was of exceptional fatality. There occurred among an average daily strength of ninety-nine non-inoculated prisoners, eleven cases (11·11 per cent.), *all fatal*; and among an average strength of 110 inoculated, five cases (4·55 per cent.), with three deaths (2·73 per cent.).

Few operations made by the author within the walls of a laboratory exceeded in precision the one just described. Its results confirmed some essential conclusions which were deduced from previous observations; and henceforth Haffkine accepted those conclusions confidently as a guidance for his future work.

In the studies described above there is one *desideratum* which a bacteriologist might have wished to see fulfilled to a greater extent than it actually was, and which the author would have endeavoured so to fulfil, had there been at the time the necessary requirements at his disposal. That refers to the bacteriological examination of the products of the cholera patients, so as to have that method of diagnosis of the disease added to the clinical diagnosis made by the physicians who observed and investigated the cases. A bacteriological examination was carried out on many patients under his charge by Dr. Powell, of Cachár, and in certain cases by the officials of the Calcutta Health Office; but in most other instances such an examination was not practicable and was not desired by the regimental or jail authorities, by the medical officers in charge, by the tea estate managers and their medical officers, or by the sanitary authorities of the country. The reason of this is that the percentage of doubtful cases in an epidemic of cholera is relatively unimportant, as is known to those who have ever been in the midst of an outbreak of this disease and are familiar with its manifestations. As a safeguard, however, against possible mistakes, the rule was adopted, on the occurrence of any uncertainty, always to record doubtful results *against* the cause of inoculation. Thus, if a doubtful illness occurred in an inoculated, it was arranged to record this as a case of failure, *i.e.*, a case of cholera in an inoculated; while if it occurred in a non-inoculated, the doubtful attack was not to be taken into account.

The effect of the anti-cholera inoculation was thus established by carefully studying the history of and comparing inoculated and non-inoculated members of the same households, the same regiments, the same batches of coolies, or inmates of the same prisons. In this way sources of error arising out of privileged social position, sanitary locality, good housing, pure food and water, or any other adventitious cause of immunity in the inoculated were obviated. Students of medicine and sanitation will, the author believes, find it not easy to reply, if they are asked to name, in the history of those sciences, a method, whether preventive or curative, the effect of which has been established with a greater degree of precision than in the case of the method under consideration.

General Results of the above Studies.

The facts of general significance revealed in the course of the studies detailed above were the following:—

(1) "Active" immunization, realized by means of a purely *bacterial vaccine*, as contrasted with immunization by means of *lymph* or *tissue* of another, previously inoculated, animal, was effective in application to man.

(2) Such immunization could be carried out with safety during the progress of acute and fatal outbreaks, as was, *e.g.*, the outbreak in the Durbhanga Jail; and the febrile and other reaction caused by the injection of the vaccine, in the doses used, did not increase the susceptibility to infection among the inoculated and did not aggravate the disease when an inoculated happened to become infected during the progress of that reaction or during the days immediately following; and

(3) The development of a rapidly incubating disease, such as cholera, could be mitigated or entirely averted by applying the same form of immunization to individuals previously infected, in whom the disease was already in the incubation stage. This latter fact, theoretically of a much more paradoxical nature than the others, received in the next two years (1897 and 1898) extensive confirmation in the results of the anti-plague inoculation, which was planned upon the results of the inoculation against cholera; and the principle thus established was adopted for guidance in therapeutic practice and applied in treating diseases actually developed, first tentatively, by some of Haffkine's co-workers in India, and subsequently by Sir Almroth E. Wright, who learned it during his visit to India as member of the Plague Commission of 1898-1901. It must be mentioned, however, that, at the time, the Commission did not see their way clear to acquiesce in the validity of the discovery and in their official report pronounced themselves against the applicability of inoculation in the incubation stage of plague. Inoculation as a remedy against a condition of infection developed beyond the incubation stage has since been extensively tried, and its effects and degree of actual utility in such circumstances are studied in many diseases.

Another feature of the anti-cholera inoculation, which was taken into account in devising the plan of the inoculation against plague, was that, while the incidence of cases of cholera and—parallel with this—the incidence of deaths from that disease were powerfully influenced by the inoculation, no effect of any constancy was observed upon the recovery rate of the inoculated attacked, a result which, unfortunately, went against the expectations suggested by *a priori* consideration of the matter. In devising the plan of inoculation against plague, endeavours were made to affect favourably also the recovery rate; and, apparently in answer to the measures adopted, the result proved successful.

Subsequent work by various experimenters and by Haffkine himself regarding the immunization of man against cholera, typhoid and plague was a continuation and outcome of the studies of 1890-6. As concerns immunization against typhoid, Pfeiffer and Kolle, shortly after 1895, undertook the first anti-typhoid vaccine operations in Germany. In their original publication on the subject the authors quote the Indian researches as opening the way

for further application of the method, and state that "as the experiments made to realize artificial immunization of man against cholera gave such an unexpectedly favourable result, the problem which presented itself next was to inquire how man would react to inoculation of typhoid bacilli." The examination of the blood of the persons subjected to such inoculation showed a certain similarity with the blood of individuals who had recovered from an attack of typhoid fever, and the authors surmised that typhoid inoculation was also likely to be effective. "We are," they state, "the more entitled to this conclusion, as the analogous experiments of Haffkine on preventive inoculation against cholera have already stood the test of many thousands of practical applications." The interest of this statement is enhanced by the fact, acknowledged in the above passage, that, at the commencement of the Indian investigations, in the memoir of 1893, Pfeiffer and Wassermann had expressed themselves as not expecting that immunization against intestinal cholera was realizable. In England, Wright and Semple started anti-typhoid inoculation upon a plan given by the author to the former worker. In their paper the writers say: "Haffkine suggested rather more than twelve months ago to one of us that the method of vaccination which has proved so effectual in combating cholera epidemics in India might, *mutatis mutandis*, be applied also to the prophylaxis of typhoid fever." Inoculation against plague was similarly a direct outcome of the cholera inoculation in India, and, as already mentioned, was based on the teachings which resulted from that work. A further application has now been given to the same methods in the preventive inoculation against dysentery.

(*To be continued.*)

Annotations.

Malarial Gangrene.—Hammond (*Indian Medical Gazette*, June, 1913) reports two cases of what he believes were examples of malarial gangrene.

The first occurred in a young Hindoo male, aged 19, who was admitted into hospital at Maymyo in a state of collapse.

On examination of the blood an enormous number of malignant tertian rings were found, one corpuscle in every three containing these forms, and each infected corpuscle often containing two or three rings. The spleen was enlarged and hard and extended three inches below the costal margin. The liver was normal and the heart and lungs were sound. There was a previous history of malaria; no syphilis. On the fifth day after admission it was noticed that the skin over both calves was becoming dusky in patches, which spread rapidly over the whole surface of the leg, and it was obvious that gangrene was threatening. In addition to his daily injection of quinine bihydrochloride 10 gr. an intravenous injection of 5 gr. to the pint of saline was given, the legs were kept warm, and every effort possible was made to maintain asepsis. In spite of all precautions three days later moist gangrene became fully established in both lower extremities and the usual train of septic symptoms supervened. An irregular line of demarcation commenced to form in both limbs and on June 20—fifteen days after admission—the right leg had to be amputated at the knee. On the left side the foot sloughed. The patient finally recovered. The other case was in a male, aged 25, admitted for fever, vomiting, pain, and inability to lift his hands. On admission both wrists were dropped, and he was quite unable to elevate the hands, which were cold and insensitive. Both feet were very cold and inactive, and œdema extended as high as the knee on both sides. Gangrene of all four extremities, which rapidly became moist and septic, developed so that the temperature, which had been consistently subnormal, rose on the seventh day after admission to one typically septic in character. Œdema of the bases of the lungs became pronounced, and the patient sank and died. No *post-mortem* was allowed, so the actual cause of the gangrene was not determined; whether the tissues died from venous thrombosis (due to lack of vitality and consequent venous stasis) or through sheer inanition from enfeebled arterial supply, or possibly arterial thrombosis, it was difficult to conjecture. In the first case, the arteries of the amputated leg showed no thrombi, but as Hammond was unable to select the site of removal, the knee-joint being chosen for the sake of rapidity, it was possible that the artery was blocked at a higher level.

The author draws attention to the fact that an interesting point in both cases was, that on admission the collapse and continued subnormal temperature were the outstanding features, whilst the history of malaria was so indefinite that if a blood specimen had not been taken the cause of the condition might have easily been overlooked. The intravenous injection of quinine which usually effects so marked an improvement on malarial coma proved very ineffectual in both cases. It is probable that the French method of sterilizing the limbs with hot air would have been useful, but no apparatus was available for the purpose, and, in its absence, it was impossible to keep the patients from developing septic infection in the dead tissues.

Climatic Bubo.—Gray, in a paper read at the Triennial Conference, January, 1913, and republished in the China *Medical Journal*, vol. xxvii, May, 1913, No. 3, discusses the subject of climatic bubo. He says that of the three sets of groin glands, the superficial oblique inguinal, the superficial vertical, and the deep inguinal, the first is the group with which one is concerned in dealing with this affection. The glands of this group are disposed irregularly along Poupart's ligament and receive the lymphatic vessels from the integument of the scrotum, penis, parietes of the abdomen, perineal and gluteal regions and the mucous membrane of the urethra. The vertical interior group receives the superficial lymphatic vessels from the leg, and the deep inguinal glands which are of small size communicate with the latter group through the saphenous opening.

With regard to the first group and the glandular enlargements it undergoes from diseases implicating the parts from which its lymphatics originate, one

has to think of the following causes, viz., malignant or venereal affections of the prepuce and penis, or of the labia majora in the female, cancer of the scrotum, abscess in the perineum, or any other disease affecting the integument and superficial structures in these parts or the sub-umbilical part of the abdominal wall or gluteal region. The lower groups become implicated in diseases affecting the lower limb.

Etiology.—The diseases mentioned in the first group gave no indication of actually being or of having been present in any of the cases seen by Gray, nor did any show evidence of malaria, for not only did he not find *Plasmodium malariæ* in the blood but quinine injections had no effect.

As regards climate, a case was seen in October and one in November. In these two cases the production of the bubo could not have been favoured by high atmospheric pressure or by any of the deleterious effects of life in a hot climate that often result in a certain predisposition in the individual which would give him a lessened organic resistance to microbic injection. Septic absorption resulting from scratch or insect bite can also be ruled out of court, for the integumentary area which is drained by the oblique glands is that part of the body which is kept covered. In addition, how many cases of dhobie itch are seen with a thoroughly septic skin in which the inguinal glands show no sign of enlargement?

Pathology.—All the cases were infections of glands of the inguinal group, and not the femoral group, a point to be remembered in discussing infective sites. Specimens taken out bodily consist of a mass of enlarged and matted lymphatic glands, many of which show more or less advanced areas of necrosis.

Clinically the patient becomes cognizant of a groin swelling which does not trouble him much. This he attributes to some strain, and hopes it will subside in a day or two, during which period he is able to walk about. In from three to eight days he seeks medical advice, and a strict inquiry fails to elicit any cause for the hard, almost painless glandular swelling. The progress of the disease is slow, and rest in bed with anti-inflammatory local treatment does not, as a rule, effect any amelioration. Blood examination reveals a steadily increasing leucocytosis. Palpation gives a sense of bogginess without any definite sign of fluctuation as is found in purulent venereal buboes. The temperature is remittent, rising every evening during the first week to 100° F., and subsequently to 101° and 102° F. The patient becomes restless and sleepless, and gives a general indication of septic infection. No other symptoms present themselves; the disease is purely local.

Medicinal treatment is of little or no use. Iodides, quinine, arseno-ferratose, &c., have all been given with no noticeable effect. In one case Gray gave 606 intravenously, and in another a course of mixed staphylococcic vaccine, but was unable to see any benefit. As far as his experience goes, the sooner an operation is performed and the glands extirpated, the more chance will the patient have of recovering quickly. Every gland that can be palpated must be removed. If done early enough, this is easy, as the glandular tissue is only slightly inflamed and the subcutaneous tissue is not adherent. The usual incision is an oblique one, but in fat abdomens with redundant integument a vertical incision is preferable, as there is not the same tendency for the edges of the wound to curl inwards. After extirpation, and after the cavity has been made as dry as possible, deep sutures reaching to the floor of the cavity and approximating both walls are inserted. A gauze wick may be left in for two or three days. Gray sums up his paper as follows:—

Sufficient cases have been found in which there is no evidence of venereal disease, past or present or even subsequently, to warrant the belief that in climatic bubo we have a specific separate disease. The term "climatic" seems inappropriate, but there is still not enough evidence to show that idiopathic or non-venereal inguinal bubo is in any way better.

This disease is different from pestis minor in many important respects. Its course is slow and non-fatal. It occurs in men in the prime of life; is neither contagious nor infectious, and is characterized by small foci of suppuration throughout the gland substance. Early extirpation of the glands is the best treatment.

Notes and News.

TROPICAL DINNER.

A JOINT dinner of the Section of Tropical Medicine and Hygiene of the International Medical Congress and of the Society of Tropical Medicine and Hygiene will be held at the Trocadero Restaurant, Piccadilly, on Friday, August 8, at 7 for 7.30, Surgeon-General Sir David Bruce in the chair. Tickets, price 7s. 6d., exclusive of wine, may be obtained at the Tropical Diseases Bureau, Imperial Institute, S.W., and after August 6 at the Albert Hall also. Application for tickets must be accompanied by cheque or money order payable to Dr. A. G. Bagshawe. Members of Congress or Fellows of the Tropical Society are requested to apply early for themselves or guests.

THE TREATMENT OF BRONCHIAL ASTHMA.

PROFESSOR ERICH MEYER states in the *Deutsch. med. Wochenschrift*, 1912, No. 38, that adrenalin treatment appears to be superior to the older atropin treatment for bronchial asthma. It is, however, but little known that in many cases diuretin is able to diminish bronchial asthma as well as the cardiac variety, as was first shown by Van den Velden. It is often sufficient to give 15 to 30 gr. before the time of the anticipated attack (evening). The preparation may be given for weeks without any injurious effects.

In the discussion which followed the paper, Professor Cahn stated that he had been giving diuretin in cardiac asthma since 1889, and that he had scarcely had a failure. The dose was 15 gr. two to three times in the late hours of the

evening. He was led to its use by the observations in a water-logged cardiac patient that diuretin did not increase the diuresis in that case, but superseded all narcotics and hypnotics in the prevention and relief of the nightly attacks of dyspnœa. Diuretin may be continued for a considerable time; one patient took 865 grm. (= 30½ oz.) in the course of fifteen months without any harm and without contracting a drug habit. Cahn also has used diuretin for many years in cases of bronchial asthma. The result is doubtful in purely nervous asthma. It is more certain in the bronchitic forms, but is especially valuable when the latter variety is complicated by cardiac debility. The reason that diuretin has not been able to establish itself firmly as a remedy for dyspnœa is partly because of its inappropriate name, which only indicates one aspect of its action, partly because it has been given in too small doses.

A NEW BRITISH JOURNAL OF SURGERY.

THE Chairman and Secretary of the Editorial Committee of the new Journal, Mr. Moynihan and Mr. Groves respectively, state in their circular that during recent years there has been great development in all branches of scientific medical research and of literature connected with these subjects. But in this country, although teaching centres, operating surgeons, and scientific laboratories have rapidly multiplied, there has hitherto been no periodical devoted entirely to surgery.

On the Continent and in America, on the other hand, there are many purely surgical journals, which contain most of that original work which always marks the advance of every great and practical science.

The extensive circulation of such journals as the *Archiv für klinische Chirurgie*, the *Beiträge zur klinische Chirurgie*, the *Deutsche Zeitschrift für Chirurgie*, the *Revue de Chirurgie*, and the *Annals of Surgery* is striking evidence of the enthusiasm for progress in their respective countries, and this is the more remarkable inasmuch as some of these papers have existed for more than fifty years, and command a wide circulation at a high price.

It is true we possess at home several periodicals in which surgical articles appear, but these only correspond with the similar general medical journals abroad, and cannot give either space or illustrations sufficient for dealing adequately with articles of a special character, which often embody much original research.

We believe that those who love their profession must often regret this absence of purely surgical literature in England, as being unworthy of the position the British nation should take in regard to that progressive science in which Lister, Simpson, Tait and many others have done pioneer work that has received world-wide recognition.

It seems to us that British Surgery at the present time has two urgent wants:—

(1) *A Periodical devoted solely to Surgery;* and

(2) *An Association of those engaged in the practice or teaching of Surgery, or in Surgical Research,* for the promotion of scientific advance by regular meetings and discussions. (Such a body would, by its corporate existence, encourage progress from within, as well as make it easier for its members to keep in touch with surgical progress as represented by similar associations in other countries.)

The establishment of an Association may possibly be facilitated by the publication of the Journal, and both may be best promoted by starting the periodical for which we now plead.

Two informal meetings have been held for the preliminary discussion of this undertaking, an Editorial Committee has been formed, and it has been decided that a BRITISH JOURNAL OF SURGERY shall be forthwith issued.

It is the Committee's intention that this shall begin as a Quarterly Journal, with the general size and quality of the *Quarterly Journal of Medicine*.

It is abundantly clear from the names of the collaborators which appear with this prospectus that there will be no lack of interest in the project, and numbers of valuable papers have already been received and promised. For the permanent success of the Journal, however, it is clear that a generous circulation is also needed.

The Editors and Publishers therefore make an earnest appeal to all those who really desire the advancement of British Surgery to become Annual Subscribers.

Each number will contain between 140 and 200 pages, will be fully illustrated, and will be made up of (1) Original Papers; (2) Critical Reviews—each article to be signed by the writer; and (3) Notices of Surgical Books, Instruments, and Appliances. The general dress and appearance will be of the highest character, and the illustrations—which will be a prominent feature—will be in the best modern style, whether black and white, coloured, or stereoscopic.

The price of the Journal is fixed at 7s. 6d. per quarter, or 25s. per year, to subscribers.

Orders and Subscriptions may be sent to John Bale, Sons and Danielsson, Ltd., the publishers of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

Personal Notes.

COLONIAL MEDICAL SERVICES.

West African Medical Staff.

July 11, 1913.

Death.—W. H. Langley, F.R.C.S.I., L.R.C.P.I., F.Z.S., Principal Medical Officer, Southern Nigeria.

No transfers.

No resignations.

Retirement.—R. M. Forde, L.R.C.P., L.R.C.S., Principal Medical Officer, Sierra Leone, retires on pension.

New Appointments.—The following gentlemen have been selected for appointment to the Staff: K. K. Grieve, M.B., B.Ch.Edin., D.T.M.Liv., Southern Nigeria; D. T. Birt, M.B., B.S.Durh., Southern Nigeria.

Other Colonies and Protectorates.

Miss S. O'Flyn, M.B., Ch.B.Edin., has been selected for appointment as a Lady Medical Officer in the Federated Malay States.

W. T. B. Meade King, M.R.C.S.Eng., L.R.C.P.Lond., F. C. Doble, M.R.C.S.Eng., L.R.C.P.Lond., and R. J. A. MacMillan, M.B., Ch.B.Edin., have been selected for appointment as Medical Officers in Uganda.

Original Communication.

A YEAR'S ANTI-MALARIAL WORK AT KHARTOUM.

By Andrew Balfour, C.M.G., M.D., B.Sc., F.R.C.P.E., D.P.H.

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Of late years but few papers have appeared dealing with the epidemiological aspect of malaria in Africa. Hence it may be of interest to give an account of the anti-malarial work in Khartoum for last year (1912), considering it in the main, but by no means wholly, from the epidemiological point of view. It was, as it happens, a specially interesting year, for, so far as can be told, the climatic conditions favoured a prevalence of malaria, and Khartoum, which has enjoyed a very considerable immunity in past years from the disease, did not altogether escape, having been visited by a small epidemic following the occurrence of a short but heavy rainfall. Moreover the town is undoubtedly suffering from the fact that, until recently, very little attention was paid to the irrrigated areas along the Nile to the north, and far outside municipal boundaries. These areas were allowed, for reasons into which I need not enter, to go from bad to worse, and as a result they began to constitute themselves a serious nuisance to Khartoum as nurseries for anophelines. This will lead me to speak of the influence of mosquito immigration, a subject of great importance, which has of late received little attention, and, indeed, since the pronouncement of Sir Ronald Ross [1] (1905) upon it, has scarcely been seriously considered save perhaps in India.

I [2] have already, in numerous papers, considered so fully the local conditions at Khartoum as regards malaria and mosquitoes that there is no need to enter into a detailed description of the locality of anopheline breeding places and other matters bearing on malarial infection. The accompanying map sufficiently illustrates most of the points to which I desire to direct attention.

It is, however, necessary to say something with reference to the population, as the figures previously given (Third and Fourth Reports, Wellcome Tropical Research Laboratories) do not now apply. A census was taken in the course of the year, and the following are the official figures for the civil population of Khartoum and Khartoum North over which the Sanitary Service exercises control.

Khartoum City and Adjoining Villages.

Europeans	1,114
Egyptians and other non-Europeans ...	8,645
Natives	15,963
Total	25,722

Khartoum North.

Europeans	482
Egyptians and other non-Europeans ...	1,467
Natives	15,176
Total	17,125
Central Prison (average)	363
	17,488
Grand total for civil population	43,210

In addition there are the British and Egyptian army garrisons, amounting in all, according to the most recent returns (1912), to 5,507 men, 780 of these being British troops—infantry, camel company, garrison gunners—Royal Army Medical and Army Service and Ordnance Corps.

I now submit a table giving meteorological statistics for 1912.

Table I.—Meteorological Statistics for 1912.

	Monthly average					Rainfall in millimetres
	Temperature, degrees Cent.			Humidity* at 8 a.m., degrees	Direction of wind	
	Maximum	Minimum	Mean			
January	28·9	13·7	21·3	30	N.	—
February	31·0	14·8	22·9	28	N.N.E.	—
March	34·5	18·6	26·6	22	N.	—
April	39·0	20·8	29·9	16	N.N.E.	—
May	42·6	26·0	34·3	17	N.	—
June	42·2	26·4	34·3	36	S.S.W.	—
July	39·8	26·1	33·0	50	S.S.W.	0·4
August	37·4	24·6	31·0	63	S.S.W.	98·1
September	39·4	25·6	32·5	48	S.S.W.	17·7
October	38·6	24·2	31·4	33	N.	—
November	35·4	20·4	27·9	33	N.	—
December	29·9	15·9	22·9	33	N.N.E.	—

* This is a little higher than the mean.

Highest temperature, 46·7 degrees Cent., May 29.
Lowest temperature, 9·0 degrees Cent., February 20.
Mean annual temperature, 29·0 degrees Cent.
Total rainfall, 116·2 millimetres.

For these particulars I am indebted to Mr. Addison, of the Gordon College Workshops, who has charge of the meteorological instruments, and is responsible for the daily observations. There is nothing of special note save the comparatively heavy rainfall during August. Table II shows how this rainfall became operative as a factor favouring mosquito prevalence and propagation.

TABLE II.—DETAILS OF RAINFALL AT KHARTOUM FOR AUGUST, 1912.

Rainfall in 24 hours, ending at 8 a.m.			Remarks.
		Mm.	
August	2 ...	11·3	Rainfall from 2.50 to 3.30 August 1.
,,	3 ...	1·1	Light rain fell intermittently from 6 p.m. August 2, to 4 a.m. August 3.
,,	6 ...	19·3	Rain fell from 4 a.m. to about 10 a.m. Very heavy 5 to 6 a.m., very light after 8 a.m.
,,	7 ...	45·6	Heavy rain 1 a.m. to 6 a.m. August 7, gradually diminished in force after 6 a.m,, and ceased 8.30 a.m.
,,	10 ...	12·9	Intermittent thunder showers from 12·30 a.m. to 6 a.m. August 10.
,.	13 ...	7·9	Gentle rain from 7.45 p.m. to 11.30 p.m. August 12.

Total = 98·1 mm.

It will be seen that it was the rainfall of August 6 and 7 which was the chief cause of the flooding. The surface soil is of such a nature that, when thoroughly soaked, it takes on a clay-like consistency, loses its porosity, and, where there are depressions, presents ideal conditions for the formation of pools and puddles. Heavy rain showers, following each other at brief intervals, converted some of these pools into miniature lakes, great stretches of land being under water.

There being no means of drainage, these water collections persisted for lengthy periods and, despite every effort in the way of petrolage, baling and even pumping, not only attracted anophelines, but also served as breeding places for them. This leads us to a consideration of the mosquito statistics for the year. These are presented in the form of two tables, one for Khartoum, the other for Khartoum North and, so far as anophelines only are concerned, are shown in a graphic manner on the accompanying map, which will be explained in due course.

In Table III, which is of a statistical nature, all the three genera of mosquitoes which are commonly found in Khartoum are considered, *i.e.*, *Culex*, *Stegomyia* and *Pyretophorus*. The last-named anopheline genus is represented by a single species, *Pyretophorus costalis*, which, judging from my experience of the Northern Sudan, must be one of the worst of the

TABLE III.—MOSQUITO STATISTICS FOR THE YEAR ENDING DECEMBER 31, 1912. KHARTOUM.

Month	Number of wells, pits, &c., infested			Number of zeers and other small receptacles			Number of steamers and boats infested			Number of pools infested			Permanent water collections in the city.	Percentage of infested permanent water collections	Last year—1911
	C.	S.	A.	C.	S.	A.	C.	S.	A.	C.	S.	A.			
January ...	24	—	—	3	1	—	1	—	—	2	—	1	911	1·97	2·67
February ...	23	—	—	—	5	—	—	—	—	1	—	8	894	2·35	2·92
March ...	25	—	—	—	2	—	—	—	—	3	—	2	885	2·82	3·23
April ...	22	—	—	1	—	—	1	—	—	4	—	20	869	2·41	2·84
May ...	16	—	2	—	—	—	—	—	—	12	—	23	865	1·96	2·37
June ...	14	—	1	—	—	—	3	—	—	2	—	3	860	1·62	2·60
July ...	39	—	1	9	1	—	—	—	—	5	—	1	854	4·56	2·18
August ...	70	—	6	30	—	—	5	—	2	45	—	53	853	8·67	3·60
September	23	—	6	3	4	—	—	—	—	7	—	16	853	2·81	2·21
October ...	13	—	1	—	6	—	4	—	1	3	—	29	849	1·41	2·11
November...	15	—	2	—	3	—	2	2	—	3	—	25	848	1·65	1·07
December ...	15	—	1	—	4	—	—	4	—	34	—	142	846	1·65	1·74
Total ...	299	—	20	46	26	—	16	6	3	121	—	323		2·82 average	2·46 average
Of the above, the following were outside the Municipal Boundaries.															
Outside Municipal Boundaries	19 Buri 3 Tuti 1 Daims (villages to south of town)			2 Buri 1 Tuti			1 "Evelyn"		—	12 Buri 1 White Nile 1 Shambat 2 Daims 1 Tuti 30 Blue Nile Banks (above Koko)		1 Mogren 1 White Nile 30 Tuti 75 Buri 10 Daims (villages to south of town) 122 Blue Nile Banks (above Koko)			
Total ...	23	—	3	1	—	—	1	—	—	47	—	239			

C. = Culex. S. = Stegomyia. A. = Anophelines.

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trate article, "A Year's Anti-Malarial Work at Khartoum,"
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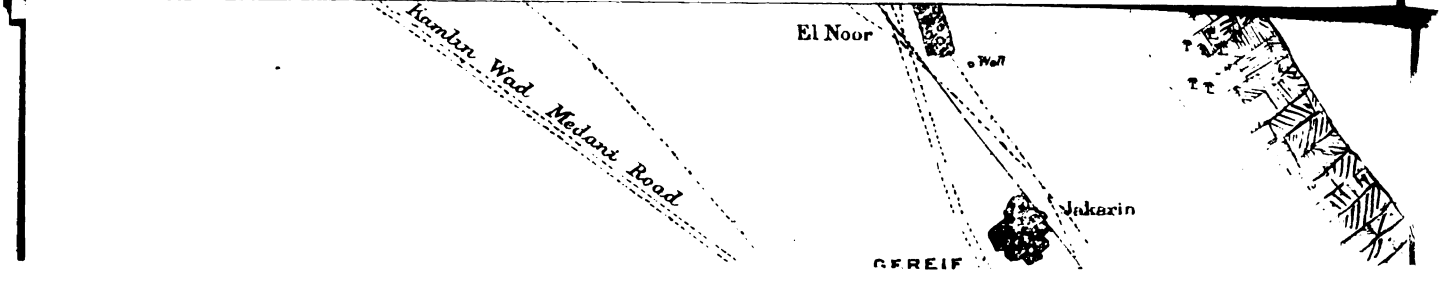

malaria-carrying mosquitoes. It will be seen that, with the exception of the anopheline pool infestations, the highest figures both for *Culex fatigans* and *P. costalis* were recorded during the rainy month of August. As a matter of fact, however, the figures for the various months cannot very well be compared, for the simple reason that latterly it has been found necessary to extend the scope of the anti-mosquito work, in other words to range further afield and bring new areas outside the town into the protected district. This is why 142 anopheline pool infestations were recorded in December, for it was at this time the heavy infestations in the Blue Nile sandbanks south of Koko village, and more especially in the so-called "Gereif Swamp" (fig. 1) were discovered. Of these more anon. It is to be remembered that these figures in the main refer to the finding of larvæ.

Table IV represents the findings at Khartoum North. Here again, August and December furnish the highest figures for anopheline infestation, and for the same reasons. In addition, however, April and May show more than the average number of pools infested. The April infestations were chiefly found in river pools, while those in May demonstrated the pernicious effect of the area of cultivated land opposite the Buri sandbank, an area which should never have been permitted so near the town, even though there is a bare stretch between it and the nearest dwellings, though this is not shown on the map (*vide infra*). It is about the end of April that the heavier pumping begins and there is more water to be got rid of.

Of the total 473 anopheline infestations recorded for the year, no less than 305 occurred outside the municipal boundaries, which, though now being extended on the north and east, were in 1912 bounded on the west by a line passing through the Mogren Point, on the east by one passing just to the east of the water-works and to the west of the farm at Khartoum North, and on the north by a line passing between the villages of Khogali and Sababa. The search is so constant and unremitting that it is but rarely breeding places are missed and the larvæ are enabled to enter the pupal stage. Still more rarely, and then usually as the result of an oversight, or of carelessness on the part of a native inspector, do breed-outs occur, as evidenced by the presence of empty pupal shells. These statements are illustrated in Table V.

TABLE V.—KHARTOUM. ANOPHELINE INFESTATIONS WHERE PUPÆ OR PUPAL SHELLS WERE FOUND, JANUARY 1 TO DECEMBER 31, 1912.

Date, 1912	Situation	Pupæ	Pupal Shells
April 11.	"Felucca," near River Bath at British barracks	1	—
May 12.	Buri (river bend)	1	—
August 26.	Waterworks, Buri	1	—
September 28.	Tuti	1	—
November 17.	Buri (one of 5 pools)	1	1
,, 23	,, ...	2	—
,, 25	,, ...	1	1
,, 26	Tuti	1	—
December 4.	,, ...	1	—
,, 10.	Sand bank above Koko ...	20	—
,, 14.	Swamp near Gereif (first inspection)	70	70

In all these infested waters larvæ were also found.

I do not say that there may not have been instances of larvæ developing into pupæ and of pupæ becoming empty shells in addition to those stated, for work of this kind cannot be absolutely perfect, and breeding places will sometimes evade the detection of the most skilled and careful inspector. Still

TABLE IV.—MOSQUITO STATISTICS FOR YEAR ENDING DECEMBER 31, 1912. KHARTOUM NORTH.

Month	Number of wells, pits, &c., infested			Number of zeers and other small receptacles			Number of steamers and boats infested			Number of pools infested			Permanent water collections in the town	Percentage of infested permanent water collections	Last year—1911
	C.	S.	A.	C.	S.	A.	C.	S.	A.	C.	S.	A.			
January ...	13	—	—	1	3	—	1	—	—	1	—	3	221	5·88	10·14
February ...	10	—	—	2	1	—	1	—	1	—	—	—	222	4·50	10·55
March ...	14	—	—	—	—	—	1	—	—	1	—	9	224	6·25	10·55
April ...	22	—	—	—	—	—	—	—	—	2	—	14	224	9·82	5·45
May ...	16	—	—	1	4	—	2	—	—	16	—	23	225	7·11	9·09
June ...	8	—	—	—	—	—	1	2	—	7	—	5	226	2·65	6·36
July ...	6	—	—	—	—	—	—	—	—	3	1	—	226	2·21	9·54
August ...	7	—	2	4	2	—	9	1	1	18	—	28	226	3·98	9·54
September	12	—	—	3	1	—	3	1	1	1	—	2	226	5·30	14·09
October ...	5	—	—	—	1	—	2	2	—	2	—	3	226	2·21	10·00
November...	11	—	—	1	—	2	1	—	1	2	—	8	226	4·77	7·72
December...	3	—	—	1	2	—	—	—	—	2	1	24	226	1·32	4·54
Total ...	127	—	2	13	14	2	21	6	4	55	2	119		4·66 average	8·96 average
Of the above, the following were outside the Municipal Boundaries.															
Outside Municipal Boundaries	2 Koko 1 Shambat									42	1	63			

C. = Culex. S. = Stegomyia. A. = Anophelines.

one knows from experience and the results of this systematic warfare that the figures are not far wrong, and it is worth while considering for a moment the condition in which Khartoum would have been during some of these months had not the mosquito-breeding operations been, so to speak, in many cases nipped in the bud.

The inspecting staff is small, especially during the leave season, which, naturally, is during the summer and consequently (if there is any rainfall worth speaking about) in the rainy months, and the area, even within municipal boundaries, large. Some parts of it are not readily accessible, and at certain times of the year, owing to the rise and fall of the river, the conditions alter from day to day. The work of the Khartoum Sanitary Service should, strictly speaking, not extend beyond these boundaries, and yet every year it has been necessary to go further and further afield. It was thought that, by controlling an area reaching from the so-called Mogren Point to the place where the Blue Nile turns sharply to the south opposite the village of Koko, Khartoum city would be efficiently protected; but this has proved erroneous, as shown by the discovery of the heavily infested banks to the south of Koko and more especially of the curious khor or swamp near Gereif, the pools of which were not visible from the river, and which was indeed only discovered by accident, and then found to be a veritable hotbed of mosquito life.

In future it will be absolutely necessary at low Nile to include a point at least two miles from Khartoum as the crow flies within the inspection area.

Similarly, at Khartoum North, the defensive operations have had to be pushed further and further north, till now, as shown by the map, they have reached the Government Farm and the river sandbanks which form near it.

This map is instructive in several ways and merits a few explanatory notes. The river sandbanks, the pools in which form the most important breeding places for anophelines, are shown as areas marked off from the river by dotted lines. The larger are distinguished by letters as follows:—

F.B. = Ferry Bank; T.N. = Tuti North; C.B. = Channel Bank; T.S. = Tuti South; T.W. = Tuti West; B.B. = Buri Bank; K.B. = Koko Bank.

In addition there are strips between the Ferry and Channel Banks and in front of the British Barracks and of Koko village.

It must be remembered that the Blue Nile usually begins to rise early in May and to fall early in October.

A riverine area to the south-west of Khartoum and hatched with oblique lines indicates the site of the so-called Gereif Swamp, to which reference has already been made.

The hatched strips along the river banks, with the exception of that which forms part of the Government farm, represent land irrigated by the natives, either by means of the sakia wheel or the shadoof (weighted pole and bucket), and are of practically no importance from a sanitary standpoint, save in so far as they may serve to attract mosquitoes. The larger areas, on the north-east of the map, hatched in horizontal lines, indicate land cultivated by means of pump irrigation and the use of irrigation channels or "gadwells" as they are called. These, and more especially that at Khartoum North, opposite the Buri sandbank, are of very great importance from the point of view of the hygienist. I have already mentioned the pernicious influence of the larger farm. Quite apart from its affording breeding-places for mosquitos unless very carefully controlled and very well managed, I wish to insist upon its acting as an attraction centre for these insects. This is a rôle played by cultivated land of this class which I am inclined to think is too often forgotten. By constant and unremitting care mosquitoes may be prevented from breeding out in such an area, they may even be prevented from finding any suitable breeding-places, though this is difficult; but they cannot be deterred from visiting such an area in search of food unless one ranges far afield and destroys their broods in places from which, if left unmolested, they would speedily invade the cultivated land. When such invasion takes place, if no breeding pools present themselves, the anophelines will seek other quarters in the neighbourhood and, if infected, may give rise to cases of malaria. It is in such a case that trap pools are found of special value. The evil influence of the farm in question has been mitigated to some extent by the establishment and maintenance of a dry zone immediately to the west of it. This zone is broken only by the chain of dwellings along the river bank. Otherwise it is perfectly bare and is usually swept by a north or south wind, which possibly explains why so few cases of malaria occur in its vicinity. (As previously stated the map is not correct in its delineation of this neighbourhood. It shows building plots on which, however, no houses have been erected.) As a rule during the winter months the mosquitoes are carried by the north wind from the farm to the Buri pools, where they endeavour to breed out. I believe they usually reach the farm by working along the eastern bank of the Blue Nile from Karkoj village via Koko. It has been discovered that at Karkoj village there are disused brick works. Here the borrow pits have been sunk in the bank below the level of high Nile and consequently at certain seasons seepage occurs and produces ideal breeding-places for mosquitoes.

The anopheline infested waters for the whole year are marked upon the map in the form of black dots, black circles, circles with crosses, and numbers. On the farm and throughout Khartoum and Khartoum North the black dots have been used, each representing a separate infestation. In the case of the town areas this serves to bring out the relationship of the infested water collections to the red dots, which indicate cases of locally acquired malaria (*see* Appendix). The total sandbank infestations are indicated by means of numbers, as are those which were found at the Khartoum Dockyard and some of which occurred on board steamers and boats (*see* Tables III and IV).

In the case of sandbanks, and also elsewhere, the infestations where pupæ were found are represented by black circles, while a black circle with a cross surmounting it indicates a breed-out, as evidenced by the presence of empty pupal shells. These pupal and pupal shell infestations are included in the number stated. Thus in the large Buri sandbank extending from the ice factory to the bend in the Blue Nile there were one hundred and eleven infestations throughout the year, in five of which pupæ were found, while in two out of the five pupal shells were discovered. On the bank of Koko thirty-eight infestations are noted, of which twenty showed pupæ.

In the Appendix further details of the infestations will be found, and more especially a consideration of the dates when they were discovered. This will be found to furnish interesting information regarding the relationship, so far as time is concerned, of some of the infestations and some of the cases of locally acquired malaria.

Attention is drawn to the comparatively large number of infestations found on the privately owned farm at Khartoum North. This would have been much greater had there not been constant supervision and a useful system of trap pools in operation. It is worthy of note that at the Government farm, where greater care has been exercised, especially during the last eight months of 1912, not a single anopheline infested water was found. It is only fair to state, however, that this farm has not received the constant attention from the sanitary inspectors that has been bestowed upon its nearer and more dangerous rival. Hence infestations may have been missed from time to time. Elsewhere I [3] have entered fully into the faulty conditions obtaining in irrigated areas in the Sudan, and hence there is no need to consider these here, but something may be said regarding the river pools. These vary greatly from year to year as regards size, position and number. Last year was exceptionally bad for them. Those at Gereif were quite peculiar, there being here a kind of khor[1] formed at low Nile by a bend in the river. (Figs. 2 and 3.) A stony area which speedily becomes grass grown is uncovered and, the surface being irregular, numerous pools, screened by grass and often with grass growing in them, form in the bed of the khor. A more ideal nursery for anophelines it would be difficult to conceive. It has been found that when the pools in the banks have clay-like, rather than sandy bottoms, they are preferred as breeding grounds, possibly because the water in such pools is usually clearer, possibly because the larvæ find more food in them.

Speaking of larvæ I may say that, so far as those of *P. costalis* are concerned, I have made a few observations on the diagnosis of their sex by the method described by Helen A. Adie [4] for certain anophelines. I have been able to confirm her findings. It is quite easy to recognize the future male by the brownish oval tumidity representing the testis and sac on either side of the sixth abdominal segment. Larvæ showing these eventually turn into male *imagines*.

In a previous paper I [5] discussed the rôle of steamers and native boats as introducers of mosquitoes both in the larval and the *imago* stage. They were again operative throughout the year, but once the quarantine station with its zeers and trap pits became an established fact, a marked improvement resulted, as indeed had been foretold. The site of the station is shown on the map as a red square. It is a little to the east of Mogren village, near the Mogren Point. The situation is very suitable, as the reclaimed land to the south, no longer flooded at high Nile, is still destitute of human habitations, and mosquitoes driven ashore either hang about and lay their eggs in the zeers and pits, are destroyed at the station, or, while the north wind is blowing, get carried over to Tuti Island, where they can do little damage, and where their broods are found and killed. Moreover, it so happens that from the station there is an extensive view up the White Nile, so that steamers can be seen approaching a considerable time before they are due at Khartoum.

Last summer trains were for the first time found to be operative on a considerable scale as mosquito vectors. Trains from the north pass close to the anopheline-ridden farms of which mention has been made. Those from the south pass alongside the Tayiba cultivation near Wad Medani, which for a time also harboured anophelines. It is no wonder then that they served to introduce these pests. Observe the incidence both of anophelines and of malaria cases round the Central Station. Mosquitoes of the sub-family Megarhininæ were found there. They have not hitherto been discovered in the Sudan and must have been introduced by the railway. It will probably be necessary to establish a quarantine trapping station here also, at least during rainy seasons.

In this connection I was interested to find that Gill [6] describes an invasion of murree in the northern Punjab due probably, or at least possibly, to the conveyance of anophelines in the adult state by means of carts and vehicles. As regards the district he investigated he concludes this "the rate of diffusion of anophelines may be greater than might be anticipated from their powers of flight alone." I should not wonder if this were found to be very generally true. It is most certainly the case in and about Khartoum. I had hoped to enter a little more fully into the important question of immigration, but I found my data are insufficient to enable me to discuss it in anything like an exhaustive manner, while the difficult mathematical problems involved tend to deter one from making the attempt. While I am still in agreement with Ross's [7] dictum that "as a general rule for practical purposes, if the area of operations be of any considerable size, immigration will not very materially affect the result," it must be recognized that at Khartoum the problem is complicated by the part played by steamers, boats and possibly trains. Moreover, the river pools may be likened to the connecting links of a chain or chains of breeding places. In

[1] Khor is a word in common use throughout Africa and signifies a dry or partially dry watercourse.

practice it is impossible to get to the distal ends of these chains, for they stretch far afield to the north and to the south-east. One can only deal with them up to a certain distance from the town, and hence there are always foci of possible infection at no great distance beyond the outermost of the treated pools. I do not think there is much emigration to be considered. For various reasons the mosquito current sets towards Khartoum both from the north and the south. It is possible that during the rains what Ross calls "flock migrations" occurred, but being absent from Khartoum at that time I can record no personal observations on this point. There is no doubt that Melville [8] is correct when he says: "However energetic and systematic an officer may be, he need never hope to eliminate all the malaria-bearing mosquitoes, nor even all the harmless individual members of that family, in his station. A station can be malaria-free without being mosquito-free, and life can be easily supported even where the gnat occasionally winds his sleepy horn, as long as the music is not too insistent." At the same time, so far as Khartoum is concerned, the cordon will every now and then be pierced, and one or two cases of primary, locally acquired malaria will remind the health officer that his persistent foes are still on the alert and have at all times to be reckoned with.

Malaria Cases.—Eighty-seven cases of locally acquired primary malaria were notified throughout the year. The following table showing the monthly distribution of these cases indicates that the great majority followed the rainfall of August:—

1912	Number of cases
January	1
February	—
March	3
April	4
May	2
June	1
July	2
August	7
September	44
October	7
November	3
December	13

Of these cases 62 occurred in Khartoum and 25 in Khartoum North, the latter being distributed as follows:—3 in March, 2 in May, 1 in July, 3 in August, 10 in September, 2 in October, 1 in November and 3 in December. Thirty-six of the total 87 cases occurred amongst the civil population, 20 amongst men of the Egyptian Army and the remaining 31 amongst British troops.

There were no deaths amongst these cases, the only fatal case of malaria recorded during the year having acquired infection outside Khartoum.

I am far from saying that there were not more primary, locally-acquired cases than the 87 recorded. I think it very probable that cases occurred amongst the native population which were never returned. Indeed, at the time when the anopheline infestation of the pools at Buri was at its worst, inquiry showed that there were some cases of fever in the neighbouring villages, and I made representations to the Sudan Medical Department which resulted in a distribution of quinine being made there. It would have been interesting to conduct a "spleen" survey amongst the children in this locality, but for several reasons this was not possible at the time. Still, I think the figures stated give a very fair idea of the state of the town as regards locally acquired cases. There was, of course, a large number of imported cases, and these, and more especially carrier cases, doubtless play an important rôle as reservoirs of the virus. In this connection a recent very interesting paper by Firth [9] may be studied with advantage. In Khartoum an effort has been made to ensure a full three months' treatment with quinine for all infected sailors and employees in the steamer department. There were two types of malaria present—quartan and malignant. Curiously enough benign tertian was not represented and the majority of the cases were due to *P. falciparum.*

The few cases occurring scattered throughout the year do not call for much notice, and perhaps sufficient has been said to explain the outbreak in September. The cases in December were rather interesting. They all occurred amongst the British troops, and the most careful search with the free use of traps failed to reveal any anopheline infection of the barracks. Further, the anopheline-infested area at Buri had been put out of bounds, while there was nothing to show that infection had been derived when the men were in camp near the Shabluka Cataract on the main Nile. After going carefully into the matter with Major Forrest, R.A.M.C., the Senior Medical Officer British Troops, we were driven to the conclusion that these were recrudescences of slight or masked cases. It appeared certain that these men were infected in August and September, but had either suffered so slightly that they had not reported or had dosed themselves with quinine bought in the town, thus keeping their fever in abeyance for a time. As soon as the cold weather set in, however, these cases relapsed and came into hospital. The distribution of cases in the different barrack rooms and quarters was kindly worked out by Major Forrest, but it was found to be very general and there was nothing to indicate any local determining cause.

The earlier cases amongst British troops, *i.e.*, those in September, were easily explained by the presence of a huge rain pool immediately to the south of the barracks. Such sheets of water, of course, attracted mosquitoes from afar, while the prevailing S.S.W. wind favoured their being wafted into the town from the central railway station, and also possibly from Karkoj and other places far outside the municipal area. British regiments invariably have amongst them men who have suffered from malaria elsewhere and who often relapse with the advent of the cold weather. One would now direct attention to the close association between the anopheline infections and the malaria cases. This is shown all over the area under consideration, the anopheline infections being marked on the map in black, the malaria cases by red dots. It is, I think, very instructive to see how the black dots and the red dots are grouped. A graphic display of this kind saves pages of description and speaks for itself. On the whole, considering the

determined anopheline onslaught, I think Khartoum escaped fairly well, but the least relaxation in vigilance, the least slackening in the work, would undoubtedly have been followed by calamitous consequences. At one period the defence was partially overwhelmed, with results which are self-evident. There is nothing to prevent another season of heavy rain, and hence it is very essential that levelling up and drainage operations be taken seriously in hand. For years one has preached this doctrine, but the question is a difficult one from an engineering standpoint, and there is a woeful scarcity of funds. Something has been done in the past, but more is required if the public health is to be safeguarded.

A word as to the use of larvicides. Petroleum has its limitations, for in pools exposed to a high wind it gets blown aside, leaving an untreated water surface on which mosquitoes readily lay their eggs. Hence we have come to rely more or less on such a preparation as sanitas-okol, which answers admirably. Recently we have been experimenting with a new preparation—izo-izal, into the larvicidal properties of which Mr. King, our entomologist, has been making an inquiry. This is not yet complete, but, so far, he has found that it kills or at least renders moribund all larvæ of *P. costalis* in half-an-hour when in a strength of 1 in 30,000. In 1 in 40,000 it is effective in one and a half hours. Pupæ require a stronger emulsion. Owing to its higher price it does not seem to possess any advantage over sanitas-okol, which, as stated, is a very satisfactory larvicide.

Creosote has also been tried, but does not seem to have any special virtue to commend it, though perhaps a more extensive trial is required. I employed it after reading what Drs. Maynard and Murison [10] had to say regarding its use. According to the latter it is not so affected by the sun's rays as petroleum, and the film which it forms lasts much longer. He does not use it emulsified with soap in the manner advocated by Maynard.

The steamer quarantine station has been mentioned. It has proved most useful. For dealing with adult mosquitoes in the cabins and holds we employ the method of cresyl fumigation described by Bouet and Roubaud [11] and in addition use the special spray together with the "Mücken" fluid which Giemsa [12] recommends. This consists of a special tincture of pyrethrum, soft soap and glycerine, the fluid being diluted for use with twenty times its amount of water.

As stated, it may yet be well to have a similar quarantine or trap station at the Central Railway Station. Trap pools on the farm at Khartoum North have proved exceedingly useful. They not only indicate the presence of anophelines, but limit their breeding operations if they are few in number. Figs. 4 and 5 show the type of trap used in houses. It is on the lines of those advocated for sandflies, and consists of a wooden box lined by a dark material or painted black inside. There is a hinged door closing it below, and in this flap door there is a hole which can be closed by a metal slide and through which fumigation can be conducted. An inspection door guarded by mosquito netting completes the simple apparatus, which has, now and then, proved useful and would, I think, be certainly valuable, given any great prevalence of anophelines. As Dr. Beam has pointed out to me, the type would be improved by altering the position of the flap door, and putting in a glass front guarded by a wooden flap. This would greatly facilitate inspection.

Lastly, I would again lay stress on the danger of irrigated areas generally, and on the part they play as "attraction centres." When the Gezira to the south of Khartoum is irrigated on a large scale, the Sudan Government will be face to face with a very serious problem. It is not, however, one which cannot be solved. With due care, the wise expenditure of the necessary funds, and the stringent enforcement of existing rules and regulations, it should be possible to carry out such work without any very great danger to the health and welfare of the community.

The lesson which has been learned in Khartoum is that in this anti-malarial warfare the motto must be defiance, not defence. It is necessary to go out to the attack, not to wait to be attacked. The further the skirmishing line can be extended, the safer will be the area which has to be protected.

The more mobile your force, the better will you be served, and every facility should be afforded the Sanitary Service for making river surveys, and for enabling the inspectors to get quickly from place to place. It is a straightforward fight, but it has to be waged carefully, persistently, and thoroughly, if it is to be successful, and one must not be surprised if, now and again, the defences are pierced. This will, however, happen but rarely if the staff are keen on the work and the sinews of war are adequately supplied.

In conclusion, I wish to make mention of the zeal and energy with which the Sanitary Inspectors have carried out the work of mosquito reduction.

I am specially indebted to Messrs. Murray and Davidson for the careful way in which they have collected and compiled the statistics for the year. To Mr. Buchanan, my senior laboratory assistant, I am indebted for the photographs illustrating the paper.

REFERENCES.

[1] Ross, R. (1905). "The Logical Basis of the Sanitary Policy of Mosquito Reduction," *Brit. Med. Journ.* vol. i, pp. 1025-1029. Also "The Prevention of Malaria," 1910. Murray, London.

[2] Balfour, A. Various articles in the first four Reports of the *Wellcome Tropical Research Laboratories.*

[3] Balfour, A. (1911). "Sanitary Notes," *Fourth Report, Wellcome Tropical Research Laboratories*, vol. A.

[4] Adie, H. A. (1912). "Distribution of Sex in the Larval and Pupal Stages of Anophelines," *Paludism*, No. 5, p. 41. And (1912) "Notes on the Sex of Mosquito Larvæ," *Ann. Trop. Med. and Paras.*, Series, T. M., vol. vi, No. 4, pp. 463-464.

[5] Balfour, A. (1912). "Mosquitoes and River Vessels," *Lancet*, vol. i, pp. 1048-1051.

[6] Gill, C. A. (1912). "Note on the Seasonal Prevalence of Anophelines with Special Reference to the Potentialities of a Single Breeding Place," *Paludism*, No. 5, pp. 65-70.

[7] Ross. *Loc. cit.*

[8] Melville, C. H. (1912). "Military Hygiene and Sanitation," pp. 376-377. Arnold, London.

[9] Firth, R. H. (1913). "The Nature and Detection of

Apyrexial Malaria," *Journal of the Royal Army Medical Corps*, vol. xx, pp. 129-134.

[10] MAYNARD, G. D., and MURISON, P. (1912). [In discussion on paper by R. Caldwell, entitled, "Malaria and its Prevention, with Special Reference to South Africa"], *Transv. Med. Journ.*, vol. vii, pp. 231-239.

[11] BOUET, G., and ROUBAUD, E. (1912). "Expériences de désinfection stégomycide par le Crésol," *Bull. Soc. Path. Exot.*, vol. viii, pp. 627-633.

[12] GIEMSA, G. (1912). "Über die Vernichtung der Stechmücken mit Hilfe des Sprayverfahrens," *Arch. f. Schiffs-u. Trop. Hyg.*, vol. xvi, pp. 565-567.

APPENDIX.

The monthly incidence of the anopheline infestations has been given in Tables III and IV. The exact date of each infestation is available for reference, and is charted, but it is scarcely necessary to give these figures here. It is, however, a matter of interest to compare the dates of some of these infestations with those of the primary locally acquired cases of malaria occurring in the vicinity of the places where *Pyretophorus costalis* was found to be breeding.

The relationship is not clearly shown at Khartoum North, but I have selected certain definite areas in Khartoum which exhibit it very well. The dates of notification of the malaria cases are arranged, for each area, in tabular form and chronological order, and parallel and similar tables show the dates of the anopheline infestations. Reference to the map will readily make the reader acquainted with the areas which have been chosen, and which are those that demonstrate the relationship in the most marked manner. I am indebted to Professor Nuttall for advice as to the method of tabulating these facts.

BRITISH BARRACKS AREA.

Dates of notification of cases of primary, locally acquired malaria		Dates of discovery of anopheline infestation	
April 19, 1912 ...		April 10, 1912	Sandbank
,, 21, ,, ...		,, 11, ,,	
,, 29, ,, ...		,, 18, ,,	
September 25, ,, (3) ...		,, 30, ,,	
,, 14, ,, (5) ...		July 20, ,,	
,, 17, ,, (4) ...		October 3, ,,	
,, 21, ,, ...		November 11, ,,	Near ice factory
October 8, ,, (3) ...		October 12, ,,	
November 17, ,, ...		,, 14, ,,	
December 3, ,,			
,, 12, ,, ...		August 19, ,,	British barracks enclosure
,, 20, ,, (2) ...		September 11, ,,	
,, 24, ,,			
,, 25, ,,			
,, 28, ,, (3)			
,, 29, ,,			

There were in addition numerous infestations on Buri Bank throughout the year.

AREA BETWEEN CHAIN FERRY AND POST BOAT LANDING BACK AS FAR AS KHEDIVE AVENUE.

Dates of notification of cases of primary, locally acquired malaria		Dates of discovery of anopheline infestation	
July 28, 1912	...	April 14, 1912	
September 4, ,,	...	June 8, ,,	
,, 17, ,, (2)	...	August 14, ,,	
,, 21, ,,	...	,, 18, ,,	
		,, 19, ,,	
		September 1, ,,	(2)
		,, 11, ,,	
		,, 15, ,,	
		October 6, ,,	
		November 30, ,,	

RAILWAY STATION AREA.

Dates of notification of cases of primary, locally acquired malaria	Dates of discovery of anopheline infestation	
September 4, 1912 (4) ...	September 26, 1912	
,, 5, ,, ...	,, 8, ,,	Tewfik Pasha Barracks
	,, 24, ,,	

ABBAS PASHA BARRACKS AREA.

Dates of notification of cases of primary, locally acquired malaria	Date of discovery of anopheline infestation
September 8, 1912	... August 25, 1912
,, 17, ,,	
,, 25, ,,	
October 7, ,, (transport lines).	

SUDANESE NATIVE VILLAGE.

Date of notification of cases of primary, locally acquired malaria	Date of discovery of anopheline infestation
August 29, 1912 ...	August 26, 1912 (9)

Sleeping Sickness.—The reports of the Sleeping Sickness Commission of the Royal Society, No. xiii, contain many interesting papers on the subject of trypanosomiasis. Duke shows that antelope are still infectious in the islands off the shore of Uganda, in the Victoria Nyanza, and they seem, since the population was removed, to have increased in numbers. Miss Robertson contributes an interesting paper on the life-cycle of the *Trypanosoma gambiense*, both in man and in the tsetse-fly. The former she terms the endogenous cycle. Her summary of the subject is that *T. gambiense* is a polymorphic species with a continuous range of variation.

The shorter forms of 14-20 μ in length constitute the normal adult blood type.

The intermediate individuals measuring 20-24 μ in length are growth forms and lead to the long forms of 23-33 μ, which are those about to divide; the polymorphism of the trypanosome is thus due to growth and division phenomena and does not correspond to a sex differentiation.

The shorter forms are those destined to carry on the cycle in the transmitting host.

There are definite periods when the blood is not infective to tsetse-flies, although trypanosomes are present. Such periods are: (1) Just before an outburst of multiplication; (2) during the destruction of trypanosomes preceding a depressed period; (3) the summit of an exalted period involving very numerous trypanosomes—at such a time the parasites very frequently show signs of exhaustion; (4) certain periods of rapid multiplication, when both the absolute and relative numbers of the shorter forms are low.

"The Journal of the American Medical Association," vol. lxi, No. 1, July 5, 1913.

Treatment of Pellagra.—Law states that the last five typical cases of pellagra in his practice have been treated with Bulgarian lactic acid bacilli in tablet form, each about 7½ gr. Two tablets were given half an hour before each meal and at bedtime.

The improvement in the appearance and subjective symptoms of these patients warrants him, he believes, in making this preliminary report.

THE JOURNAL OF

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AUGUST 1, 1913.

BRITISH MEDICAL ASSOCIATION.

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Wednesday, July 23.

DISCUSSION ON THE CAUSES OF INVALIDING IN THE TROPICS.

Opened by Dr. G. BASIL PRICE, Colonel R. J. S. SIMPSON, C.M.G., A.M.S. (ret.), and Dr. W. F. LAW.

Dr. G. BASIL PRICE, in opening the discussion on the "Causes of Invaliding in the Tropics," remarked that many factors influenced health and disease, such as average temperature and thermic influence; humidity of atmosphere; elevation of different districts; the persistence of endemic disease, prevalence of mosquitoes and malaria during certain seasons; the insanitary conditions associated with Eastern and primitive life; the prevalence of infective disease, such as tuberculosis, malaria, amongst native populations.

Special factors also influenced the health of Europeans in the Tropics, such as the location of the individual according as to whether in a large city or in a remote district; the habits of the individual as regards food, alcohol, exercise, &c., and individual idiosyncrasy, namely, temperament and the possession or absence of "common sense."

Dr. Price discussed the section of Europeans in the Tropics belonging to missionary bodies.

The total of 1,479 lives were distributed as follows:—

	Total	Men	Women
India	533 lives	245	288
Ceylon	65 ,,	32	33
China	394 ,,	162	232
Japan	105 ,,	29	76
Africa:			
North, Algeria	20 ,,	12	8
Egypt, Palestine, Arabia	71 ,,	19	52
West and Nigeria	65 ,,	34	31
Central, and East Africa and Uganda	152 ,,	79	73
South	31 ,,	25	6
Madagascar	14 ,,	5	9
Persia	29 ,,	10	19
Total	1,479 ,,	652	827

Analysing the causes of invaliding in these various countries, the following facts emerge.

India.

Church Missionary Society lives.—379 (men 188, women 191), of whom 93 were invalided—24·5 per cent.

Other societies.—Invalided 154 (men 57, women 97).

CAUSES OF INVALIDING IN THESE 247 CASES.

		Percentages	
Nervous conditions of a neurasthenic type	51 = 20·6	25·4	
Mental disorder of acute type	12 = 4·8		
Enteric fever	41 = 16·6		
Malaria	33 = 13·3		
Dysentery	16 = 6·4		
General debility	12 = 4·8		
Pulmonary tuberculosis	8 = 3·2		
Cardiac disease	8 = 3·2		
Anæmia	8 = 3·2		
Small-pox	4 = 1·6		
Gall stones	3 = 1·2		
Eye conditions	3 = 1·2		
Blackwater fever	2 = ·8		
	203* out of 247.		

* The remainder being isolated cases, having no particular bearing on tropical life.

The prominence of "nerve strain" and neurasthenic conditions is worth noting, and whilst this was the terminating phase before invaliding, it must be remembered that illness, chiefly malaria or bowel disorder of a comparatively light character, had occurred in probably many of these previously, and were factors in inducing both this condition, as also general debility, anæmia, and functional cardiac conditions.

China.

It is interesting to note that a decidedly large proportion of "nerve" cases occurred in North China; perhaps some cause for this may be found in the drier atmosphere, and also long periods of monotonous sunshine, which tends to promote at first increased mental and physical activity, but afterwards leads on to nervous irritability, a condition often hastened or exaggerated in many cases by the long-continued political unrest in that country, with the frequent reign of mob law, and scenes of violence.

Insanity, characterized by mania, religious delusions, or melancholia has unhappily occurred in all parts of China, but is most marked in Central China, according to these figures.

Japan.

In Japan, whilst the general conditions for health seem good, "neurasthenia" is even more prominent as a cause for invaliding than in China.

The Church Missionary Society gives records of 105 lives. Of these 17 or 16·1 per cent. were invalided (6 men and 11 women).

Of this number 14 were due to neurasthenic conditions, that is, 81·25 per cent.

It has been suggested that the inhalation of monoxide fumes from charcoal stoves in the

Japanese houses may partly contribute to the nerve and head symptoms met with in missionaries, but also the constant occurrence of earthquakes is a contributory factor in nerve conditions.

Africa.

The figures are, unfortunately, small, but enteric is present as a definite cause in North and South, absent in Central and West Africa.

Malaria is the cause of 75 per cent. in West Africa, blackwater fever and malaria 40·4 per cent. in Central Africa, where also occur isolated cases of tick fever and sleeping sickness. Neurasthenia again is prominent as a cause in North, Central, and South Africa, forming 20·8 per cent. of the whole.

Dr. Price worked out the average years abroad of missionaries for each sex, periods of invalidings at home, the percentage of invalided for each country, and the incidence of disease. These figures may be best shown by the following tables:—

Isolation, overwork, under-staffing of stations, the heavy incidence of minor illness which does not immediately necessitate invaliding, the possible experience of scenes of violence and alarm, especially during recent years in China, will try the most placid or callous temperament, and largely accounts for the heavy incidence of this class of disease, *i.e.*, 20 to 80 per cent. of invaliding.

(3) The prominence of a large class of infectious diseases calls for note, since an average of 42 per cent. of invaliding is due to them.

Against this latter class many safeguards can be taken; small-pox should never occur if re-vaccinations were enforced. Enteric fever should be greatly diminished with wider and more frequent recourse to inoculation and extended knowledge as to methods of infection amongst the laity.

Malaria and blackwater fever can be more nearly controlled if more persistent efforts were made to efficiently teach all who go abroad the facts so universally acknowledged as to malarial prevention.

CHURCH MISSIONARY SOCIETY RECORDS.

	E. Africa, Uganda	W. Africa, Nigeria	Arabia, Egypt, Palestine	Persia	India	Ceylon	China S.	China Cent.	Japan	Total
Number of recorded lives	125	65	71	29	379	56	123	98	105	1,051
Men	60	31	19	19	188	25	40	31	29	433
Women	65	34	52	10	191	31	83	67	76	618
										Average
Percentage Invalided	20	18·5	26·7	17·4	24·5	5·3	8·1	20·4	16·1	17·4
Percentage of incidence of disease (not necessarily invalided)	88	86·1	77·5	65·6	73·6	75·0	65·9	69·39	61·9	73·7
Percentage free of disease	12	13·9	22·5	34·4	26·4	25·0	34·1	30·61	38·1	26·3

From this table it will be seen that Egypt, Arabia, East, Central and West Africa are, on the whole, the countries which offer greatest risks to health.

CHIEF CAUSES OF INVALIDING.

	Invaliding—Chief causes	India	China	Japan	Africa
Class I	Nerve conditions of a neurasthenic type	20·6	25	81·25	20·8
	Insanity	4·8	8·8	—	1·5
Class II	Enteric fever	16·6	9·8	—	8·2
	Malaria	13·3	11·8	—	19·4
	Dysentery	6·4	5·9	—	3·7
	Pulmonary tuberculosis	3·2	10·8	—	3
	Small-pox	1·6	1·4	—	1·5
	Blackwater fever	—	—	—	9·7
Percentage due to Class II. diseases		41·1	39·7	—	45·5

Conclusions.

(1) That a missionary's life and sphere of work is not a matter or place of healthy recreation.

(2) That capacity for "nerve strain" is a real factor to be considered in passing candidates to go abroad, and therefore it would be wise to exclude those who have any decided taint of mental instability in their family history, also those of highly nervous temperaments, except for special location and work. The impulsive, enthusiastic, but easily depressed person will not stand the strain of the conditions inseparable from a tropical life and work, unless there is also a leaven of common sense, humour, and good self-control.

Referring to the section I represent, many societies do not even yet see the necessity for any systematic instruction on health and hygiene for their missionaries, whilst they insist on a too long course (as it seems to the writer) in theological studies, if health and life have to be sacrificed for it, owing to the missionaries' ignorance of tropical dangers, and the safeguards which should be practised.

(4) The frequent appearance of pulmonary tubercle—due generally to infection abroad—points to the necessity for eliminating by medical examination all those who may from their family or personal history have shown predisposition to the disease.

(5) Most of the lives considered in the above statistics are select lives; the examinations by many of the societies being as strict as for a large insurance policy; but the need for such medical criticism and elimination of the unfit still needs emphasizing to certain other societies and associations.

Dr. Price gave as an addendum a compendium of the enteric and tubercular cases in several countries.

"South African Medical Record," vol. xi, No. 11, June 14, 1913.

Leprosy.—Bayon in the above number of the *South African Medical Record* critically reviews the recent experimental research work that has been done upon Leprosy. The paper goes into the subject in great detail and is well illustrated. Those specially interested in the subject should consult the paper in the original.

Abstract.

PROTECTIVE INOCULATION AGAINST CHOLERA.*

By W. M. Haffkine.

(*Continued from p. 222.*)

Part III.—Vaccine "II" after Devitalization.

CONDITION OF THE CHOLERA VACCINE AFTER DEVITALIZATION.

Conservation of Essential Properties in Devitalized Vaccine: Its Reactionary and Immunizing Effects.

Some of the most notable properties imparted to vaccine "II" by peritoneal cultivation, namely, the enhancement, up to a certain constant level, of its toxic and immunizing effects, are still observable in that vaccine when it is devitalized by delicate chemical or physical processes. Apparently devitalization in these circumstances leaves uninjured part of the specific substances stored up during life in the bodies of the germs. The preparation of such devitalized vaccine and the results of its injection into animals and man have been described by several authors to whom Haffkine had occasion to demonstrate its effects.

Devitalization by carbolic acid reduces, or altogether suppresses, the mortifying effect which vaccine "II" has on the guinea-pig's skin; and the effect on man is also correspondingly mitigated. In all cases, however, the degree of fever and of local reaction is in direct connection with the *dose* administered. The desire of lengthening the duration of protection and the uncertainty, which at present cannot be removed, as regards the precise amount of vaccine which will ensure an immunity of a given durability, have often led operators into using exaggerated doses in inoculating man. This circumstance is responsible for the impression that the reaction after the inoculation is severe and stands in the way of a wide application of the method.

As has been stated already, inoculation with devitalized vaccine confers on animals a lesser degree of immunity than inoculation with the same vaccine in a live condition. It remains possible, however, that the former preparation may still have preserved sufficient potency for immunizing man against natural cholera. The solution of this question in the affirmative would bring about great practical facilities in the application of the method; for devitalized vaccine can be handled as a chemical drug and may be preserved and supplied to distant operators, who thus require no preliminary training in the *technique* of its preparation, such as is necessary in the use of live vaccine.

It is, therefore, desirable that devitalized vaccine "II"—already used on a certain scale in 1892 and 1893 and on various occasions subsequently, and the further investigation of which has been delayed until the question of anti-cholera vaccination was decided in principle by means of the more reliable preparation—should be subjected to a careful study in cholera epidemics.

Expectations of other Observers.

The view just expressed has the endorsement of various authorities, some of whom have recommended the use of the vaccine in question, while others have already been trying it in practice.

Kolle recommends the following method of human inoculation: a well-grown culture containing about 20 mg. of growth is suspended in 10 c.c. of physiological salt solution and sterilized for a few minutes at 50° C.; 0·5 per cent. phenol is added to the preparation without apparently interfering with the effectiveness of the virus.

The plan of inoculating man with the devitalized form of cholera vaccine has, further, the endorsement of a number of bacteriologists who, as stated, have actually tried it, in some cases, on a considerable scale. The first operations on such a scale, with vaccine prepared in the Bombay laboratory, were carried out and studied, under Haffkine's directions, in August and September, 1900, by the late Major Lamb, I.M.S., and Major Buchanan, I.M.S., Superintendent of the Nagpur Central Jail. The vaccine was used on 451 prisoners of that jail, eighteen of whom received two injections. No cholera cases occurred in the jail subsequent to the date of inoculation, whether in inoculated or non-inoculated prisoners.

The beneficial effects obtained, since 1897, from the anti-plague prophylactic, the wide application of which has been facilitated by the devitalized condition of the virus, have stimulated attempts to apply the same plan for the protection of man from typhoid and cholera and, latterly, from certain forms of dysentery.

Among those who have used the devitalized anti-cholera vaccine subsequent to the inoculations in Nagpur may be cited the bacteriologists of the Japanese Imperial Serum Institute, while in the following years many other inoculations with the same vaccine have been performed in various parts of the world.

In 1904, a Russian physician, Zlatogoroff, inoculated in Tauris, Persia, 1,269 invididuals. In 1905, Serkowski first performed a few dozen inoculations at Kharkoff and Lodz; then, in 1907, Zabolotny reported at the International Congress of Hygiene and Demography, in Berlin, a considerable extension of the work which had taken place in the Volga region and elsewhere in Russia. In that and in the subsequent year, 4,877 people were inoculated in the Southern provinces of that country, while in St. Petersburg the number reached 31,637. In the Ekaterinoslav province, Lookiantchenko inoculated, in 1907, 11,178 people, and Maslakowetz, in the summer of the same year, 4,287 in the town of Astrakhan and its suburbs. Between 1906 and 1909, inoculation with devitalized cholera

* Calcutta: Thacker, Spink and Co. London: W. Thacker and Co., 2, Creed Lane, 1913.

vaccine was carried out also in several districts and provinces of Russian Poland, such as Parczew, Kielce, Tuszyn, Ozorkow, Piotrkow. The vaccine was manufactured in St. Petersburg, in the Imperial Institute of Experimental Medicine.

In the Dutch East Indies, in Batavia, Nyland has inoculated, since 1910, 31,000 people, including 8,000 Europeans.

The Question of the Degree of Immunity obtainable from Devitalized Cholera Vaccine.

The documents which Haffkine has been able to examine on this essential matter show that the authors were in a position to obtain only approximate information as to the immunity derivable from the vaccine.

Metchnikoff makes a somewhat similar statement. Referring to the inoculations which were performed in Persia, in 1904, in various provinces of Russia, in 1907, and in St. Petersburg, in 1908-09, he points out that the inoculated were generally persons not exposed to the same chances of infection as was the average population; that those who availed themselves of the preventive treatment belonged to such classes as observed also precautions of general hygiene; that individuals living in localities already infected, or in any way specially liable to contract the disease, were refused inoculation, so as not to discredit the procedure in the eyes of the public; and that the incidence of cholera among the inoculated was not accurately known. The official instructions issued at the time by the authorities enjoined, indeed, on the operators certain rules which were reasonable from a general point of view, but which tended to interfere with the subsequent estimation of the results.

The precise circumstances of the operations just referred to are unfortunately unknown to Haffkine; but he presumes that in many cases the operators, though using the vaccine in a devitalized form, considered that they were applying a method the general protective effects of which had already been established; and their efforts may have been absorbed mainly in meeting the demands of individuals who applied for inoculation or agreed to avail themselves of the protection which it possibly offered. Under such circumstances, the conditions required for a scientific study are rarely realized. When, at the end of an epidemic, the operators collect information concerning the results and endeavour to extract from it the teaching it offers, they almost invariably find the data incomplete. Not infrequently that incompleteness is clearly perceived by the operator and acknowledged by him. Thus, in the case of the most extensive of the above-mentioned inoculations, those carried out in Japan in 1902, Murata, in his account of the work, quotes the studies made in India on cholera immunization with live vaccine and states that he introduced inoculation in the Hiogo district, with the devitalized preparation, at the desire of the inhabitants, who were severely tried in the outbreak of that year. In regard to the 77,907 persons who availed themselves of the treatment and to the incidence of cholera among them, he states that he has reason to view the results optimistically, but adds:—

"I am unable to say whether the protective inoculation was applied uniformly under all circumstances, or whether the inoculated and the non-inoculated were equally exposed to infection. It is impossible for me to enter into such circumstances with a degree of exactitude, as the inoculations were carried out by many hands. However this may be, one cannot deny that the mortality among the inoculated was much smaller than among the non-inoculated."

From the details supplied previously in the present note, it will have been seen that the sources of error alluded to by Professor Metchnikoff were obviated in the Indian studies of 1893-1896; but, as mentioned, those studies were made with live, and not with devitalized vaccine.

Experiments with Vaccine Extractions.

The precise effects of inoculation with the devitalized form of the vaccine require, therefore, to be submitted to further investigation. In doing so, the most reliable preparation ought, in Haffkine's opinion, to be tried first, the actual study being conducted on lines analogous to those which were worked out in India in 1893-6. He deals first with the question of the form of the vaccine.

A considerable number of bacteriologists have adopted a favourable view as to the ultimate effects of devitalized vaccine and have recommended for use extractions of such vaccine. The extraction is obtained, in some instances, by merely leaving the vaccine to soak in water, at the temperature of the room or incubator, then filtering off the solids and using the watery solution; in other cases the process is aided by triturating the bacillary bodies in water or serum, or by freezing them and thus rendering them more brittle; or by subjecting them to the effect of an alkali, or alcohol, or ether, or common salt, or sulphate of sodium, &c. Such extractions have been prepared with the germs of cholera, typhoid, bubonic plague, dysentery, chicken cholera, pig-septicæmia, hæmorrhagic septicæmia of cattle, *Bacillus coli*, &c.

The question as to whether vaccine should be used in extraction or in its entirety was dealt with, in reference to plague, by the Indian Plague Commission of 1898-1901, when examining Lustig and Galeotti's proposal of applying "nucleoprotein" (alkali extraction) of plague bacilli for anti-plague inoculation. The Commission did not commend the plan, and, so far as Haffkine is aware, in the twelve years which have elapsed since then, nucleoprotein has not come into use. He thinks this result is not without bearing on the question. As he has already intimated, it is not possible at present to determine accurately the particular constituents of the bacterial body which create in an animal immunity against natural disease, though it is already apparent that in different diseases the effective agents must differ in constitution. For

the present, therefore, one is on surer ground by transforming into vaccine the whole of the substances of the germ which the individual has to deal with in the event of infection. Then, the use of the entire germ, compared with extractions made from it, offers facilities of considerable importance in the matter of manufacture. For the purpose of making the extraction, the scale of preparation would need to be increased to many times its present volume, for only a small amount of specific matter is obtainable in solution from a given volume of vaccine. The larger the scale of preparation, the more complicated are the measures necessary for assuring satisfactory results. Further, the *technique* of effecting the actual extraction, of handling, with all the requisite care, the additional substances necessary for this, of applying the various procedures which are suggested for facilitating the solution, and of filtering off the residual solids, on a scale required for practical purposes, is a far heavier addition to the work than is the extended scale of cultivation.

In this connection Haffkine refers to the plan which Besredka, of the Paris Pasteur Institute, has suggested with the object partly of mitigating the reactionary symptoms caused by the cholera, plague and typhoid vaccines, partly of meeting the danger which is believed to result from inoculating persons previously infected or about to become infected with the disease. The plan consists in emulsifying the vaccine, in its entirety, in water, passing it through fine silk, immersing for twelve to twenty-four hours, at a temperature of 68° F., in serum of preliminarily immunized animals, washing it three or four times in saline water, and centrifuging after each washing, till the removal of all traces of serum has been assured. This procedure obviously involves a degree of elaboration to which, if carried out on a small scale, there can be little objection, but which becomes of importance when the volume of material is large, and when, at every stage, great precautions are necessary for obviating the possibility of mishap. It may be observed that the reactionary symptoms caused by inoculation are only very marked when exaggerated doses of vaccine are used; while the danger from inoculating persons incubating or about to incubate infection has been definitely proved not to exist. The additional exposures involved in Besredka's plan of manufacture would, therefore, to Haffkine's mind, not be sufficiently compensated for by the expected advantages.

The Methods of Study in Preventive Medicine.

As regards the mode of investigation of research in the case of the devitalized cholera vaccine this must, in Haffkine's opinion, be as strict and scientific as that employed to establish the efficacy of the live vaccine; for the immunizing properties of the two preparations differ sufficiently to render it unsafe to rely upon inferences from the one to the other.

There is only one way of finding out, as a lasting scientific truth, whether a method such as vaccination against small-pox, cholera, plague or typhoid fever, protects man against those diseases or otherwise; and the way is that of studying the subject in the midst of and in application to the communities which it is intended to protect. This, indeed, has been the plan he has applied in India.

The conditions of such a study are obviously very different from those obtaining in a bacteriological laboratory or in an animal outhouse; and the responsibilities of the work are, needless to say, widely different. The methods of obviating experimental illusions and arriving at the right facts and deductions are special and cannot be worked out without prolonged investigation; and the difficulties of execution, every part of which, whether preliminary and tentative, or final, has to be performed in the glare of publicity and under the incessant observation and opposition of critics and opponents, are on a scale not to be measured only by the scale of the studies themselves. The operations alone, besides a vast amount of laboratory work, imply travelling over long distances, combating prejudice, apprehension and obstruction; searching for suitable conditions of inquiry and for volunteers, in their hundreds and thousands, ready to undergo loss of time and temporary illness, for advantages yet unknown; waiting indefinite intervals of time for a concurrence of events necessary for the study of results; carrying out house to house investigations and tracing individuals who have become concerned in the experiment; investigating causes of absence and of disease or death, by conferences with local authorities, relatives and medical attendants, and a variety of other laborious inquiries and proceedings unknown in work on animals. The subsequent part of the investigation, the study of the facts, is an elaborate and technical research. It comprises a scrutiny of the data collected and the determination of all possible sources of error and of the methods of their elimination; an analysis of the results, and the collection of such supplementary data as have been found to be necessary; and the formation of conclusions and their verification. When the investigator has established the main facts for which he has been searching, and has assured himself of their reality by experiment many times repeated, long years must further elapse before other observers, of an impartial mind, are in a position to verify his findings and to assist in ensuring their acceptance by the world at large.

It is on account of these circumstances that, inevitably, endeavours have been made to solve questions relating to man by experiments on small animals—guinea-pigs, rabbits, mice, &c.—which could be handled in the laboratory. A vast amount of valuable information has thus been obtained; but, unfortunately, differences of organization and of the conditions of life, both in health and disease, make it often impossible to conclude from the effect upon lower animals the effect on man. Thus, for instance, the fact that *active* immunization offers a means of saving individuals who have contracted a rapidly incubating disease would have remained undiscovered without the studies of cholera and

plague in man; for experiments on laboratory animals gave diametrically opposite results and indicated that, during the first succeeding days, immunization not only did not protect from, but directly predisposed to and aggravated such a disease, and that when infection had been contracted previously an attempt at immunization would render a fatal issue inevitable. The whole subject of inoculation against cholera offers, of course, an instance of a problem which could not be solved by experiments on animals. An attempt is, therefore, frequently made to arrive at conclusions concerning the immunization of man, by examining samples of blood and serum from individuals operated upon, or else by subjecting inoculated persons to artificial infection, in a manner permissible in human beings.

The last-mentioned plan of investigation was, perhaps, as well and as fully exemplified as it could be in the experiment described by Metchnikoff on the two men inoculated by the author in 1892. The difficulties in arriving at a reliable conclusion by that method are due to the wide divergence between the mode of infection as it takes place in Nature, on the one hand, and as it is done in the laboratory, on the other; to the restricted number of individuals on whom the experiment can be attempted and the idiosyncrasies of the patients which, in these circumstances, affect the results; and to the impossibility of trying on man a decisive mode of infection. Thus, concerning the last-mentioned point, in the case of the two persons referred to by Metchnikoff, a conclusion had to be formed both from the apparent mitigation of their choleraic symptoms and from the degree of general malaise experienced by them, while the interpretation of the latter symptom was complicated by the fact that it possibly included some manifestation of defence against infection. Metchnikoff, therefore, rightly indicated, in the wording of the conclusions which were cited above, that he did not view that experiment, or the experiments made on rabbits, and the *a priori* considerations connected with vaccination against poisoning, as containing the data for the final solution on the question.

The information obtainable from the other mode of inquiry, that of examining blood samples, instructive in very many ways as it is, is equally far from being of a decisive character. In view of the importance of the matter involved and of the weight which, on various occasions, has been attributed to such information, it is perhaps desirable to examine with some detail the experience gained in it.

Human blood serum, when injected into a guinea-pig simultaneously with, or a day or so prior to an injection of a lethal dose of cholera virus, is found in certain cases to have the effect of obviating the fatal action of such virus. In 1892, Lazarus observed this property in the serum of men who had recovered from an attack of cholera; and in the same year, Klemperer found it in the serum of men artificially inoculated with cholera germs. Pfeiffer and Kolle's observations of 1896, made on the blood of persons inoculated with cholera vaccine, both in its live and devitalized conditions, were on analogous, though not identical, lines. The question is how far the appearance in the blood of the above-mentioned property indicates that the individual possesses the necessary immunity to protect him against cholera. The following facts bear on the matter:—

(*a*) Of twelve Europeans examined by Metchnikoff and who were free from any previous history of cholera, five were found to have in their serum substances which protected guinea-pigs against a fatal injection of cholera germs, and seven had no such substances.

(*b*) Of twenty-two Europeans suffering at the time from cholera and similarly examined, protective substances were found in the serum of ten and not found in the twelve others.

(*c*) In the bodies of ten persons who succumbed to cholera, protective substances were found in five cases; and

(*d*) Of twenty-four persons who recovered from a cholera attack, protective substances were found in fourteen.

Metchnikoff summarizes these observations on the preventive power of human blood thus:—

"It results from our researches on the property of the blood of sixty-eight persons, that that power with reference to the typical vibrio, of Indian origin, is extremely variable. It exists in almost half the men who have not had cholera, and in 58 per cent. of persons who have had an attack. Almost half the cholera patients and half the individuals who died of that affection present equally the preventive property of the blood. One may consider as proved that natural recovery in cholera takes place without the appearance of the preventive property of the blood. On the other hand, that property may develop without preventing the man attacked with cholera from dying of the disease, even in the first period of its evolution."

Observations of a similar purport have been made in Kolle's laboratory, where it has been seen that the serum of an inoculated individual, when used on an animal infected with cholera germs, may have the effect of destroying those germs, and yet be inefficient in preventing a fatal issue of the disease. These results, conjointly with the results mentioned higher up and with others to be quoted presently, unfortunately render uncertain some of the grounds on which Kolle had formed favourable expectations with regard to the author's devitalized cholera vaccine.

Another illustration of the same nature is the fact that a guinea-pig immunized against the cholera germ contains in its blood substances by means of which it is possible to protect other guinea-pigs against the same germ; after a time these substances disappear from the blood of the immunized guinea-pig, but the latter remains immune.

In plague, Strong, following Kolle and Otto, finds that live virus has greater immunizing powers than any form of devitalized vaccine; yet when he examined the serum of twenty-six persons inocu-

lated with such virus, he found that it possessed neither the power of agglutinating the plague germ, nor that of protecting an animal against plague infection.

The above instances could be easily multiplied, but those given should suffice to show that, at present, it is no more possible to infer from blood examination the existence of immunity in an inoculated man or animal, than to infer from the natural or conferred immunity of a lower animal the existence of similar immunity in man. Authors who have worked on the lines under consideration are not unaware of the inevitable uncertainty of the conclusions obtainable in that way. Thus, referring to vaccination against cholera and the effects of the watery extraction of the author's devitalized vaccine "II," Strong states:—

"We have seen that by the subcutaneous injection of the cholera prophylactic" (extraction of vaccine "II") "an excellent cholera immune serum can be obtained in human beings. However, the question naturally arises, whether these individuals are protected against intestinal infection with the cholera spirillum. In other words, are they really immune to the disease, Asiatic cholera? Experiments upon animals cannot satisfactorily answer this query. . . Since animals are not naturally susceptible to intestinal infection, and since it is only through artificial means that such may be produced in them, evidently the answer to our question can be given only by a practical observation of the human beings inoculated with the prophylactic during a severe and general epidemic of the disease. . . . It would appear from the numerous statistics of Haffkine in India, and the more recent work of Murata in Japan, that simply by the injection of a small amount of the killed organism a certain degree of immunity against the natural mode of infection is acquired. Therefore, judging from what has already been said, it is probable that by the use of our prophylactic, human beings may acquire a good active immunity against the disease."

General Summary.

A description has been given of the experiments by means of which the possibility of immunizing man against cholera has been demonstrated in the studies in India with live vaccine "II." The nature and the mode of preparation of that vaccine have also been described.

A number of observers have concluded from this result, and by inference from observations on animals and on human blood serum, that the same vaccine in a devitalized condition, as used tentatively in the author's experiments of 1892-93, and again, on a somewhat larger scale, in 1900, was also likely to be useful. The further study of that preparation in India has been delayed by the advent of the plague; but the above expectations are justifiable. An investigation on the subject, made in the midst of actual outbreaks of cholera, under conditions of accurate scientific research, following the lines which have been described, is desirable, in view of the advantages which a devitalized prophylactic offers in practical application, and of the great difficulties in the way of using live vaccine on an extensive scale, under the conditions prevailing in many parts of the country.

Just as it was important to obtain first a positive result on the question of cholera immunization in general, and to use, in investigating that matter, the most reliable vaccine preparation, so it is important to avoid in the beginning the possibility of failure in the study of the vaccine in a devitalized form. For this reason it is preferable at present to use the devitalized vaccine in its entirety, as against extractions or other derivations of it. The facilities of manufacture in the cost of the entire preparation are also of considerable importance.

In devitalizing vaccine "II," it is essential to employ only the most delicate physical and chemical processes.

Two forms of that vaccine in devitalized condition commend themselves to the author for first investigation:—

(1) One, prepared by prolonged cultivation in a fluid medium and devitalized by heat and carbolic acid;

(2) The second, prepared by cultivation on a solid medium and devitalized, as soon as developed, by a solution of the same antiseptic compound.

The study of the protection derived from the employment, separately, of these two forms of vaccine, in various doses, should afford information as to the direction in which the plan will require to be modified for further study.

(*Concluded.*)

Annotations.

A Clinical Test for Malaria.—Atkinson, in the *Lancet* of June 28, 1913, draws attention to Schlesinger's reaction for demonstrating the presence of urobilin in the urine. This can be obtained in patients suffering from malarial fever even when the malarial parasites are absent from the peripheral blood.

As is well known, the high colour of urine in malaria depends upon the increased amount of urobilin present. Plehn, in 1909, recommended this very delicate and simple reaction to demonstrate the presence of urobilin in the urine. To obtain it the following are required: (1) Schlesinger's solution, which consists of zinc acetate, 1 part; alcohol, 10 parts. (2) Tincture of iodine. (3) A sample of urine to be tested.

In a test tube one-third filled with the unfiltered urine an equal quantity of Schlesinger's solution, which has previously been well shaken, is added. A few drops of a weak solution of tincture of iodine are now poured in, as this accelerates the reaction. The mixture is then filtered, and if urobilin be present the filtered mixture shows a more or less distinct

fluorescence. This reaction is met with in the urine of patients suffering from all types of malarial fever. To show how delicate it is, in cases of malignant malaria it can be obtained after diluting the urine with 200 parts of water. Quite healthy urine does not give the reaction, as it contains, if any, only the slightest amount of urobilin. Urobilin is present, of course, in many other diseases, such as cirrhosis of the liver, liver abscess, many infectious diseases, &c.

Atkinson used the test frequently in the Government Civil and Victoria Hospitals, Hong-Kong, and found it useful, particularly in diagnosing doubtful cases where parasites were not present in the blood. The absence of the reaction speaks strongly against acute malarial fever, a fact of great value when a quick diagnosis is to be made.

Notes and News.

DR. MINETT, of Georgetown, British Guiana, has recently demonstrated the presence of Leishmania in that Colony, having found such parasites in specimens of smears from "forest yaws." In some of these sent home to the London School of Tropical Medicine, Leishmania are present in large numbers. Although forest yaws and similar parasites have already been reported from Dutch and French Guiana we believe that this is the first authenticated record of the demonstration of Leishmania in British Guiana. Dr. Minett proposes to give a full account of the case in due course.

APENTA WATER IN WEST AFRICA.

REPRESENTATIVES of the Medical Faculty, practising in West Africa, express favourable views of the usefulness of Apenta Water in that country, especially as a preventive and cure of chronic constipation.

Professor Külz, Imperial Government Physician, Cameroons, observes that he has always given the preference to it in the West African Tropics on account of its many advantages. He points out that it is specially in hot climates that the European is predisposed to suffer from constipation, partly because of the loss of fluid from the skin, partly by change of diet and partly as a sequel to the most prevalent of tropical maladies, viz., malaria! The Professor testifies that Apenta has proved itself a mild but reliable aperient, free from unpleasant after-effects and one which patients take readily. The water has also been found to bear the heat of the Tropics well.

IMPERIAL INSTITUTE.

SYNOPSIS OF CONTENTS OF THE "BULLETIN OF THE IMPERIAL INSTITUTE," VOL. XI (1913), NO. 2.

THE second quarterly issue of the *Bulletin* of the Imperial Institute contains, among the reports of recent investigations by the Scientific and Technical Staff, an article on cotton-growing in the Sudan, with reference chiefly to the proposed scheme for cotton cultivation under Anglo-Egyptian auspices, involving a guarantee by H.M.'s Treasury of the interest on a loan to be raised by the Sudan Government amounting to three millions sterling; and the space usually occupied in the *Bulletin* by special articles is devoted exclusively to a comprehensive report (illustrated) on "Tea: its Cultivation, Manufacture, and Commerce," by Dr. S. E. Chandler and Mr. John McEwan, a notable feature in which is the pre-eminence, in the figures quoted, of the people of the British Empire as tea-drinkers—the consumption *per capita* being no less than ten times that of foreign countries, excluding the United States. A notice on the cultivation and preparation of Turkish tobacco refers to the progress made, in that respect, in South Africa. Among the General Notes is an interesting reference to the rock-structure of Egypt, contained in a recent Report of the Egyptian Geological Survey, to the effect that, contrary to the prevalent view, "erosion following local folding"—and not fault-effects, or trough-faulting—is, perhaps, sufficient to account for all the observed conditions. The latest official statistics are given of the total mineral production of Ontario and Western Australia; and numerous notes deal with recent progress in agriculture and the development of natural resources, chiefly within the Empire.

ERRATUM.

DR. BATES writes, pointing out that a line of his original manuscript in his "Review of a Clinical Study of Malarial Fever in Panama," Part II, which appeared in the June 16, 1913, number of the Journal, has been omitted. Under the heading of *Differential Diagnosis*, p. 182, line 12, it is stated: "Thus, in the quotidian fevers these phenomena occur within approximately a period of forty-eight hours, or, rather the paroxysms, &c." This should read: "Thus, in the quotidian fevers these phenomena occur within approximately a period of twenty-four hours, while in the subtertian these phenomena occur within a period approximating forty-eight hours, and its febrile curve holds through or delays during a period of twenty-four or even forty-two hours, and then remission or slight intermission takes place."

The omission of the line of course renders the text inaccurate and misleading.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

A REVIEW OF A CLINICAL STUDY OF MALARIAL FEVER IN PANAMA.

By John Pelham Bates, M.D.
Ancon, Canal Zone.

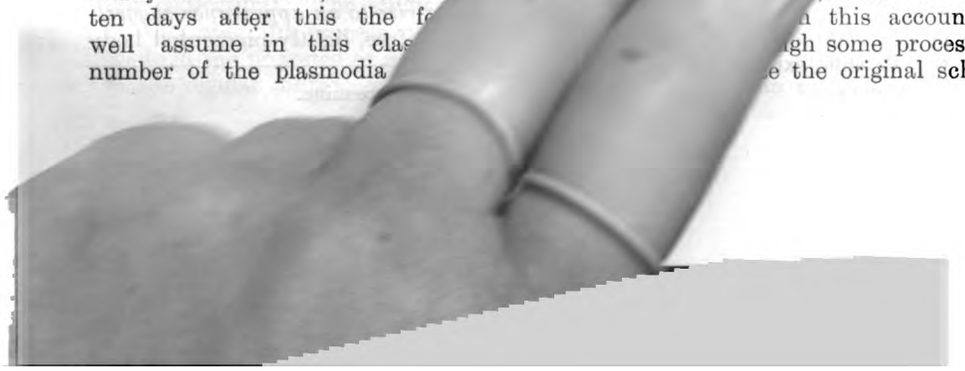
IV.

Relapse in Malaria.

It appears from my observation that relapses follow the primary invasions in malaria so frequently that they, like anæmia, may with propriety be considered a syndrome of malarial disease. It is not certain, however, that all the recurrences I have noted are true relapses. For in a tropical country like Panama, with the infectious agent present throughout the entire year, it is not an easy matter to separate relapses from reinfections. A large proportion of our population is well protected by screening and mosquito destruction, but the nature of the canal work is such that exposure to reinfection cannot with certainty be eliminated. That is to say, most of our population work out of doors, and they go to work before daylight, and often return to their homes after sunset, and hence expose themselves at the time of the day when mosquitoes bite the most greedily; and a number of the labouring class live in quarters of their own providing without screening, and unprotected except for the work of the mosquito brigade. Thus, with these conditions prevailing, one necessarily meets with considerable difficulty in the study of relapses.

I have been able, though, from time to time, to have under observation a small number of malarial cases in which reinfection could be eliminated, and which I could watch from the primary invasion through the various relapses that followed. Among these there were a few which I could control as to treatment and regimen, and in this number checking relapses has not appeared very difficult, for in most of these the recurrences have ceased with one or two or three attacks, or four at most. It is important to note that in three persons with apparent relapses, as soon as their quarters, which had been screened a short time previously, were thoroughly fumigated the relapses immediately ceased.

It is especially among children, who are always active and impatient of control, and adults whose duties force them out again too quickly after the subsidence of the fever, that the relapses are most troublesome and persistent. In this class of patients, the active ones, it is found that the relapses occur at short intervals, such intervals, for instance, as two or three weeks, and on up to one month[illegible] months, or even four months. It is found[illegible] having intervals of from three to four[illegible] usually subjects who have taken quin[illegible] doses, 10 to 15 gr. a day, during[illegible] finally discontinue it, when after[illegible] ten days after this the fe[illegible] well assume in this clas[illegible] number of the plasmodia[illegible]



the effect of the drug, and hence, when quinine is discontinued, multiplication begins anew, and thus a recurrence of the original symptoms takes place. The intervals of time between these attacks then bear some relation to the thoroughness of treatment in the primary invasion or in the succeeding attacks. Thus, if the treatment is perfectly thorough, there is of course no relapse, but failing in this, treatment may be of any degree of inefficiency, from those cases in which the active symptoms are barely ameliorated, and recurrence takes place so promptly after the quinine is discontinued that the recurrence is no more than an exacerbation of symptoms, and so on through various widening intervals, according to the vigorousness of the treatment.

There is a more general class of relapses than this, of people who may reside in malarious countries, and who may be the subject of several attacks of malaria, and who finally reach a stage in which they can continue to live in malarious countries in a state of apparent well-being, but as soon as they change to a cooler latitude or a cooler climate by virtue of a higher altitude, they are immediately struck down by an attack of fever. Such was the case in the early days in our work in Panama, when most of the Americans exposed were the subjects of malaria. They, after having suffered two or three attacks of malaria in Panama, began to remain in a state of well-being as long as they continued to reside here, but as soon as they made a change back to their homes in the States a portion of them would be immediately attacked by fever. These relapses were separated by periods of five, or six, or eight months and sometimes even longer. Quinine was frequently taken during these intervals, usually prophylactic doses of about 9 gr. a day.

There are yet other relapses from this latter class, those which are reported from time to time that are separated by periods of several years. These I shall refer to later. The relapses then of people residing in malarious countries and exposed to infection are quite different from the short interval cases I have first named, and to account for this latter class of relapses is not so easy as in the first. One naturally wonders in what form have the plasmodia existed during all this time. Have they continued to develop regularly in the usual schizogonous cycle in small numbers, under the check of immunity principles produced in the blood and the phagocytic properties of the leucocytes? Or have they developed a resistance—a property that parasites are said to possess of "altering rapidly, not their form and external appearance, but their chemical reaction and probably structure, when too closely pressed or menaced," in brief, "state of effective resistance or fastness"? [1] [illegible] preserve their existence by the formation [illegible] that lie dormant, awaiting a favourable [illegible] to reproduce the original strain? Finally, [illegible] manage to preserve themselves through the [illegible], which we know are unaffected by quinine [illegible] this account manage to survive, and later [illegible] some process of *aberrant development* repro[illegible] the original schizogonous cycle? All of these

questions have answers in analogous properties of other lower orders of life, and hence all have been advocated in various theories or hypotheses to explain the cause of relapse in malaria.

I do not think it is necessary to attempt to discuss all of these questions, but prefer to take up those which have been developed into working hypotheses and which have the greatest number of followers, and one I shall discuss on the account of its uniqueness.

Among the answers to these questions that have been developed into working hypotheses there are three. First, residual parasites—parasites that have managed to survive the effect of quinine, and continue to develop in the usual asexual cycle. Second, parthenogenesis, as advanced by Schaudinn and his followers. Third, intracorpuscular conjugation, as advanced by Craig, in which he believes a body is formed to harbour the dormant spores. The unique one has been recently suggested by Thayer [2] as a possible explanation of the cause. This suggestion was introduced on account of an article by Rowley-Lawson, [3] in which she describes a series of phenomena in the male and female crescent bodies, which were interpreted to be evidence of sexual development in the human host. Rowley-Lawson's studies were made in a series of blood smears containing crescents and asexual forms of the plasmodia, and they were carried out in great detail by photomicrographs, &c. She explains that the reason this phenomenon has not been observed heretofore is because it takes place very rapidly, in the internal organs—the spleen and bone marrow. The phenomena she describes are, that in the male crescent bodies there was displayed within them small chromatin filaments, flagellate-like in appearance, and in the female crescent the chromatin particles were arranged into a sporulating-like formation, and thus she assumed that these latter bodies had been fertilized by the filaments or flagella of the male crescents, and segmentation was taking place.

This paper is remarkable in that she describes these forms as evidence of a sexual cycle in man in the face of the fact that the Italian school and Manson have already described these same metamorphoses, and explained their cause. Marchiafava and Bignami [4] have described these phases in detail in contending against the sporulation of female crescents in man, and have shown that the metamorphoses pictured by Rowley-Lawson occur in crescents only when they are exposed to some disintegrating process, usually in moist-chamber smears, which was used for expediting flagellation. And they show that when disintegration in the crescent's protoplasm has taken place by virtue of the moisture, the arrangement of their nuclear chromatin can be seen within them. In the macrogamete the chromatin is arranged rosette-like around the pigment wreath, and this arrangement gave to some observers the idea of sporulation of these bodies; in the microgametocyte the nuclear chromatin is arranged in flagellate-like filaments. The arrangement of the nuclear chromatin in the male gamete caused Manson to suggest that the flagella existed preformed in the adult or "ripe" crescents.

Now, if one will note carefully Rowley-Lawson's [5] plates it will be readily seen that all her crescents are in states of disintegration. Their cytoplasm is fissured and broken into granular clumps, in contrast to the smooth and regular plump forms of crescents seen in smears freshly prepared and freshly stained, showing that she must have been working with old and much-used smears. Even if the phases she described had not already been noted and described, and their cause explained, she has not given a sufficient explanation why the many and painstaking observers have not accidentally seen these phases from smears from the puncture of spleens, and in autopsy smears from patients dead only a few hours. Indeed, a crescent has been seen in an autopsy smear from the spleen (Darling), with small filaments of chromatin flagellate-like within it, but this also occurred in a smear that had dried slowly in a humid atmosphere. The work of Rowley-Lawson is well done and interesting, but her conclusion is not at all convincing, and the phenomena as illustrated must be accepted only as phenomena displayed when degenerative changes have occurred in the protoplasm of the crescent bodies.

Intracorpuscular Conjugation of the Plasmodia.—Mannaberg [6] first called attention to intracorpuscular conjugation of the malarial organism, a phenomenon through which he believed the formation of the crescent bodies occur. Ewing [7] later described what he interpreted to be intracorpuscular conjugation, but he appears to consider it of no especial significance in the life phases of the malarial organism, and thinks the phenomenon occurs very rarely. Craig [8] has lately taken up the hypothesis of intracorpuscular conjugation again, and makes use of it to explain the cause of relapses in malaria with more than ordinary long intervals. The phenomenon as usually described may take place when two young ring forms occupy the same red corpuscle. Conjugation begins by the amœboid movements of the young ring bodies. The cytoplasm of each organism is pushed out in prolongation until it meets with its opposite fellow, when blending of the cytoplasmic substance of each organism begins. Fusion of the cytoplasm when complete gives rise to a larger ring body with the original chromatin nucleus of each yet intact, the chromatin particles usually occupying various positions in the cytoplasmic ring substance of the new organism. In the further development of the resultant body the chromatin particles unite, forming an irregular chromatin mass occupying a position somewhat within the ring body. According to Craig [9] the resultant organism or zygote formed by conjugation continues its development until it completely occupies the substance of its corpuscular host, and ultimately destroys the red cell, thus becoming a body free in the blood plasma. The free body contains pigment, but the pigment is in smaller amounts than in other forms not produced by conjugation, and "in some instances the chromatin masses are numerous, and are collected at one side of the organism, *giving rise to an appearance suggesting sporulation.*"* This free, lightly-pigmented body

* Italics are mine.

he believes becomes encysted, and contains spores. The whole body is resistant to quinine and other injurious influences, and retires to the spleen and bone marrow to await a favourable circumstance, when the spores are liberated. The liberated spores now enter the red corpuscles, and thus begins anew the original schizogonous cycle, and in this manner he assumes relapses are precipitated.

If I understand fully Craig's description of this free, pigmented, or "resting-stage" body, I believe it is the same pigmented body that has so long given me trouble to interpret, and which I now know to be nothing more than an unripe schizont of the quotidian parasites. I believe I have already described this free, pigmented body in describing the developmental morphology of the quotidian parasites, and correctly interpreted its function in the life phases of this variety of malarial parasites, in which it was seen that this body was a schizont or presegmenting body. This explains why the chromatin in Craig's "resting body" is sometimes arranged in such a manner as to suggest sporulation. I am prepared to admit an intracorpuscular fusion of two amœboid protoplasmic particles, but I am not convinced that Craig's lightly-pigmented, resting-stage body is the resultant or zygote from such a fusion.

Parthenogenesis.—The second hypothesis of parthenogenesis arose from the behaviour of the gametes in the presence of quinine. The gametes appear to be wholly unaffected by the drug, and at times may be found in the peripheral blood for some time after the asexual forms have apparently disappeared. These facts then have been seized upon by numerous observers to explain the reappearance of fever after long intervals of well-being in malarial subjects. The idea of the cause of relapses by quinine-resistant gametes was further strengthened when Schaudinn while studying the blood of a patient in a tertian relapse saw a female gamete undergo a series of changes which he interpreted as parthenogenesis. And from this observation he immediately concluded that parthenogenesis was the cause of relapse. Grassi [10] had in 1901 already seen certain changes occur in a tertian macrogamete, which he interpreted as parthenogenesis. Schaudinn's study has been followed by Maurer [11], Neeb [12], Harrison [13], Karrewij [14], and others. Each of these observers has seen and followed similar changes in tertian macrogametes as described by Schaudinn, but the changes noted by these latter workers occurred not alone in relapses, but in the regular course of tertian malaria. Karrewij, I believe, was the only one of these latter workers who was willing to commit himself that the phenomenon as seen was true parthenogenesis.

I may admit for the sake of argument that parthenogenesis may occur in the malarial gametes, but it has not been proved that this form of development occurs solely in relapse, and its relation to relapse is at best but conjectural. The studies that have been made of this aberrant process of development have been made in the presence of asexual parasites, developing in the regular schizogonous cycle, and it appears to me that in order to make the evidence for parthenogenesis complete, as the cause of relapse, the phenomenon should occur only when gametes are present, and the asexual forms are absent from the blood. This demand upon the advocates of parthenogenesis is not too great, for it is no difficult matter to find cases where there are only gametes present in the blood.

After this review of the various hypotheses introduced to explain the relapse in malaria I may now return to the first and older theory of residual parasites in malaria, which, like the poor, we have always with us, and if it has no other merit, it at least has that of simplicity, and admits of rational treatment.

All are familiar with latency in malaria—in which persons in malarious countries harbour parasites in the blood, and under ordinary circumstances these parasites do not give rise to any symptoms. For the term latency, I prefer the term, the *stage of tolerance*, and I believe that the stage of tolerance is one of the first steps in the process towards acquired immunity to malaria. All relapses occur during the stage of tolerance, and the intervals between the relapses, that is, whether long or short, depend first upon the thoroughness of the treatment of the primary invasion or in the succeeding attacks, and second, upon the degree of immunity already established. I hold then that the relapses in malaria are not produced by aberrant process of development of either the asexual parasites or the gametes, but they are brought about by residual parasites too few to be detected in the blood, which continue to reproduce themselves in the usual asexual cycles. They are held in abeyance for a time by the immunity principles of the blood and the phagocytic properties of the leucocytes. When circumstances are favourable to the parasites from some breaking of the advantage held by the host, the parasites multiply to numbers sufficient to reproduce the symptoms of the original attack.

Darling [15] in 1909 undertook a work among the labourers and other inhabitants in the Canal zone to ascertain the number of malaria "carriers" or latent cases that were among this class of people. March was selected as the best month of the year for this work, for it is at this time that malaria is at its lowest ebb in Panama, and hence reinfections are less likely to be encountered. He found in 276 persons examined, all of whom were up and about their regular duties, that 13 per cent. harboured malarial parasites in various stages of development. A critical analysis of Darling's findings will be found highly significant in connection with the cause of relapse in malaria. Indeed, the analysis appears to be not only significant in this connection, but actually to answer the question. Thus, in Darling's cases there were found thirty-four people harbouring parasites; of these twenty-six disclosed the parasite to be in the young ring forms or in partially grown forms; while in only eight were the parasites shown in the gamete forms exclusively. In these tolerant cases then the parasites were developing steadily in the regular asexual cycles, and yet not giving rise to active symptoms, and one among the number in whom the malarial organisms were

developing in the usual asexual forms, had just been discharged from the hospital nine days previously. Here, then, it is shown that over three-fourths of all the tolerant cases were harbouring parasites, which were developing in just the same way as they are seen to do in the course of regular attacks of fever. If, then, people can harbour the usual asexual forms of parasites while up and about their duties for even short periods of time, it is not unreasonable to assume that they may do so indefinitely or until sufficient quinine is taken or immunity principles are produced to check further development of the parasites.

The chances favouring residual parasites in the blood even in treated cases are too numerous to be passed over. In the first place, I have noted in discussing chronic malaria that patients grow tired of a never-ending dosing with quinine, and finally reach a stage where they take sufficient quantities only to relieve the urgent symptoms, and then discontinue the drug till necessity drives them to it again. In these instances all the parasites are certainly not destroyed. I have recently watched a patient who has been having recurrent attacks of fever for about a year. In his three last attacks I have examined his blood, and found the same variety of parasites present in each succeeding attack. The last attack was separated by an interval of four and a half months. During this interval he was prevailed upon to continue quinine in doses of 10 gr. a day, which he did up to within a period of ten days before the last attack observed. At this time he grew tired of the quinine, and discontinued its use, when, after an interval of ten days, the fever recurred, with the same forms of parasites again present. Even in what we presume are well-treated cases the asexual parasites are not all destroyed, as I have just shown in Darling's series of cases, in which one man still had young ring form parasites in the blood, although discharged from the hospital nine days previously. Ross and Thomson's [16] case of relapse is another instance of a well-treated case with residual asexual parasites in the blood. Thus, after taking 30 gr. of quinine continuously for fifty-seven days, in which time the parasites were below the detectible limit by even Ross's "thick-film" method, this patient developed a relapse after quinine had been discontinued for "a few days."

I have notes of two other cases, one of which on 15 gr. of quinine solution daily continued to have fever for seven days, with an afternoon's rise of temperature reaching to 103° F., and which was not checked until quinine was increased to 30 gr. a day. The other one, whose blood on admission to the ward was negative for either sexual or asexual forms, received 30 gr. of quinine solution daily for six days. After this time the quinine in solution was reduced to 10 gr. daily for a period of twenty-two days. On the twenty-eighth day after admission there was an afternoon's rise of temperature. On the following morning the blood was again examined, disclosing young ring forms and numerous crescents.

It is here shown, then, that every circumstance favours residual parasites. First, in people who refuse to take sufficient quinine to be effective; second, cases in which the physician may not very well estimate the quantity of quinine necessary to destroy all the parasites; and finally there are other cases in which in all probability the patient cannot safely be given quantities of quinine sufficient to be effective in the destruction of all the parasites. In addition to the circumstances which may favour the probability of the residual parasites, I have shown by the analysis of Darling's [17] tolerant cases that people may harbour parasites for periods of time unknown, for the simple reason that no one has carried out a detailed study in these cases to ascertain what becomes of the parasites or how long they may exist. In other instances, such a study is not possible, for all the forms, asexual and sexual, are below the detectible limit, by our methods of examination. There is, therefore, nothing in reason to prevent one from inferring that people may harbour parasites which develop regularly in the asexual cycles indefinitely, or until they are checked by efficient treatment, or by immunity. Indeed there is everything in reason to lead one to infer that such is the case.

Immunity, combined with treatment, become factors which finally limit relapses. The time it may take for an individual to develop immunity to malaria is not known, though it is reasonable to assume from experience that this is not more than two or three years in most instances. I have shown in discussing chronic malaria that immunity developed in one case in eighteen months. On the other hand, I reported another case in which there had been thirteen attacks of fever during a period of six years, and the patient was not yet wholly immune, as, at the time he came under my observation, in the thirteenth attack, he had a temperature of 103° F., and an abundance of parasites in the blood. But it is important in this case to remember that the patient had been, all the time during the six years, exposed to renewed infection. He had, however, developed a certain degree of immunity in that he was able to bear thirteen attacks of fever, and yet show a red cell count of 4,240,000 per cubic millimetre with a hæmoglobin value of 92 per cent. Thus, the time for acquiring immunity may be over long periods, and once acquired, it may be later lost altogether. As an instance, I may relate my experience in person with malaria. I have been the subject of seven widely separated attacks of malaria in my lifetime. The first of these occurred at four years old, and continued for a period of four months, to finally cease. My father, a country practitioner, was suffering from irregular attacks of fever at the same time, and his attack continued well over into the following year. I remained and grew up in the locality where I had received the primary infection, through a healthy boyhood and adolescence, all the time exposed to infection, and wholly ignorant of its source. At 17 years of age I was again the subject of another attack of malaria. This attack continued for five days. I have since had five other attacks, two of which have occurred in Panama. Thus it appears that I

developed an immunity which continued for about thirteen years, after which it disappeared, and left me in a state highly susceptible to every new source of infection. Omitting the repeated attacks in childhood, I have never suffered from relapses in any of these subsequent attacks of malaria fever.

It now remains to note the relapses that are reported to occur after intervals of from three to five to seven and thirteen years. I do not believe that such cases are relapses, yet I have no well-proved facts by which I can contradict them, all I can offer is, that the course of malarial relapses is against their occurrence. Thus the issue becomes a matter of *beliefs*, the discussion of which makes for no advance in medicine. I shall therefore dismiss them, and await a report of a long interval relapse in malaria, in which all the evidence is so complete that there can be no grounds for denying them, and confine myself in closing to what appear to be well-proven facts.

Ross and Thomson [18] have recently reported a series of cases in which 17 per cent. showed a slight rise of temperature after the paroxysms of fever had ceased under quinine, and while the quinine was continued without decreasing the doses. They term these slight rises of temperature pseudo-relapses. In a certain number of the cases they were able to explain the cause of the second rise of fever by intercurrent disease, but in others there was no explanation, yet from blood examinations malaria could not be demonstrated as the cause. I have had some experience with this class of relapses. In these I believe I have been able to demonstrate the cause. I have found that where intercurrent disease was not the cause it was due to allowing the patients to be up too early and to eat too freely immediately after the subsidence of the fever, hence detracting from the efficiency of the quinine treatment. I have therefore considered these slight second rises to be true mild relapses with the parasites below the detectible limit. Ross and Thomson [19] have since reported an instance of true relapse on vigorous and continuous quinine treatment, which proves that my inference with regard to these later slight elevations of temperature are true mild relapses.

I have now discussed some of the various hypotheses that have been advanced to explain the cause of relapse in malaria—parthenogenesis, intracorpuscular conjugation, sexual development in the human host. I have shown that their connection with relapse is only conjectural, and that they depend more on inference in this connection than they do on proof. I have shown that the chances for a few of the regular asexual forms of the parasites surviving the effects of quinine and continuing to multiply are numerous, and I have also shown by calling attention again to the well-known facts of latency in malaria, that the malarial parasites survive and continue to develop in the asexual cycles over indefinite periods of time. These facts then being true, there is every reasonable ground to assume that residual parasites, although they may be so few in numbers as to be below the detectible limit by our methods of examination, also can continue to survive, and multiply slowly until a favourable opportunity offers, when they increase rapidly, and thus bring about the next succeeding relapse. I therefore hold that aberrant processes of development of either the gametes or the asexual parasites are not necessary to explain the cause of relapse in malaria. And with Ross [20] and others, rest content with the simple hypothesis of residual parasites "until a better one is established."

BIBLIOGRAPHY.

[1] Flexner, Simon. "Biological Basis for Specific Therapy," *Boston Med. and Surg. Journ.*, November 9, 1911, p. 710.

[2] Thayer, Wm. S. "On Malarial Fever with Special Reference to Prophylaxis," reprint from the Harvey Lectures, Series 1911-1912, J. B. Lippincott and Co., Philadelphia.

[3] Rowley Lawson, Mary. "The Estivo-Autumnal Parasite: its Sexual Cycle in the Circulating Blood of Man, &c., &c.," *The Journ. of Experimental Med.*, vol. xiii, No. 2, February 1, 1911, p. 263.

[4] Marchiafava and Bignami. "Malaria," *Twentieth Century Practice of Medicine*, vol. xix, 1902, pp. 44-59.

[5] Rowley-Lawson, Mary. *Op. cit.*

[6] Mannaberg, J. "Nothnagel's Encyclopædia of Practical Medicine," p. 52.

[7] Ewing. "Clinical Pathology of the Blood," New York, 1903, p. 454.

[8] Craig, Chas. F. "Studies in the Malarial Plasmodia after the Administration of Quinine, and in Intracorpuscular Conjugation," *Journal of Infectious Diseases*, vol. vii, No. 2, March 1, 1910, pp. 285-318.

[9] Craig, Chas. F. *Op. cit.*

[10] Grassi. Cited by Ross, Sir R. "Prevention of Malaria," E. P. Dutton and Co., New York, 1910.

[11] Maurer, G. *Centralbl. für Backt.*, &c., November 5, 1902.

[12] Neeb, H. M. "The Parthenogenesis of the Female Crescent," Journal of Tropical Medicine and Hygiene, vol. xiii, No. 7, April 1, 1910, pp. 98-102.

[13] Harrison, W. S. *Journal of the Royal Army Medical Corps*, December, 1910.

[14] Karrewij. Cited by Bignami, A. "Concerning the Pathogenesis of Relapses in Malarial Fever." Translation by Dr. W. M. James, *Southern Med. Journ.*, vol. vi, No. 2, February, 1913, p. 80.

[15] Darling, S. T. "Studies in Relation to Malaria," Govt. Print, Washington, D.C., 1910.

[16] Ross and Thomson. "A Case of Malarial Fever Showing a True Parasitic Relapse during Vigorous and Continuous Quinine Treatment," *Annals of Tropical Medicine and Parasitology*, vol. v, No. 4, February, 1912.

[17] Darling, S. T. *Op. cit.*

[18] Ross and Thomson. "Pseudo Relapses in Cases of Malarial Fever during Continuous Quinine Treatment," *Annals of Tropical Medicine and Parasitology*, vol. v, No. 3, December, 1911.

[19] Ross and Thomson. *Op. cit.*

[20] Ross, Sir R. "Prevention of Malaria," E. P. Dutton and Co., New York, 1910, p. 115.

PRELIMINARY NOTE ON A NEW FLAGELLATE, *CRITHIDIA HYALOMMÆ*, SP. NOV., FOUND IN THE TICK *HYALOMMA ÆGYPTIUM* (LINNÆUS, 1758).

By Captain W. R. O'Farrell, R.A.M.C.

Protozoologist to the Wellcome Tropical Research Laboratories, Khartoum.

(Forwarded by Dr. Albert Chalmers, Khartoum.)

THE protozoal parasite which forms the subject of this foreword is found in the common cattle tick of the Anglo-Egyptian Sudan—*Hyalomma ægyptium* (Linnæus, 1758).

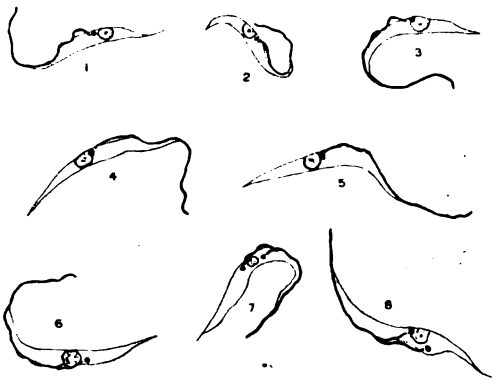
In this brief note I confine myself to a short description of the flagellate stage, leaving a more detailed account of the organism and its life history for a future communication.

Flagellate Stage.—This stage is best studied in the cœlomic fluid of the tick, where, indeed, many of the pre- and post-flagellate stages may also be observed.

The adult parasites present the usual crithidial type of body, but are unusually long and slender. The length of the body and flagellum varies from 26·0 to 48·0 μ, the length of the flagellum alone being usually 12·5 μ. The average breadth is 2·5 μ. The breadth of the nucleus varies from 2·0 to 2·5 μ.

The flagellar extremity tapers gradually to a narrow point, while the flagellar end is continued for some distance along the flagellum.

The undulating membrane is well marked, running from the neighbourhood of the blepharoplast to the flagellar extremity of the body.



Crithidia hyalommæ (O'Farrell, 1913).

EXPLANATION OF FIGURES.

All figures outlined with Abbé-Zeiss camera lucida, after wet fixation with osmic vapour and absolute alcohol, and stained with Giemsa's solution; 2 mm. apochromatic objective (Zeiss) and compensating ocular 12 used.

Figs. 1 to 5.—Flagellate Crithidia, showing relative position of blepharoplast and nucleus.

Figs. 6 to 8.—Various stages in division.

The nucleus is roundish or oval, and generally lies about the middle of the body, the whole breadth of which it nearly occupies.

In quiescent stages the intranuclear material is compact, but when active division or cyst formation is about to occur it becomes granular. In the quiescent stages it contains a well-defined central karyosome.

The blepharoplast is usually situated on the flagellar side of the nucleus. In appearance it may be rounded or rod-shaped, and when it assumes the latter form it is placed tranversely to the long axis of the body. At times it may be closely applied to the exterior of the nucleus, from which it can readily be differentiated by its assuming a deeper tint with the usual stains. It often presents a diplosome appearance; and when division is about to take place it apparently splits into two bodies, one of which moves to the aflagellar aspect of the nucleus which, in this way, comes to lie between the two portions of the original blepharoplast. The flagellum, taking its origin in the vicinity of the blepharoplast, to which it is not connected, runs along the free border of the undulating membrane until the extremity of the body is reached. Here it escapes from the periplast and projects freely for a considerable distance. No basal granule has so far been noted.

The movements of the adult flagellate are moderately slow. In forward progression the flagellar end is anterior, but it may move at times with the aflagellar extremity situate anteriorly. This latter movement usually occurs only in short-distance movements, or when the organism is about to turn round.

The method of the forward movement may be described as follows: The body and flagellum describe an arc of a circle, then they suddenly fly back, straightening the organism, which is driven forwards by the fibrillary movements of the undulating membrane and the oscillations of the flagellum, which often shows very rapid whip-like lashing movements, especially if the organisms are present in large numbers or are attached to debris.

Classification.—From the above description and the attached drawings it will be obvious that the parasite belongs to the genus *Crithidia, Léger emended Patton*, 1908, and I therefore propose for it the name of *Crithidia hyalommæ*.

"South African Medical Record," vol. xi, No. 12, June 28, 1913.

Leprosy.—The above number of the *South African Medical Record* is devoted to leprosy. The following papers will be found in it: "The Surgery of Leprosy," by T. Lindsay Sandes, M.A., M.D.; "The Care of the Leper," by R. Morrow, M.D., Ch.B., M.A.; "Symptomatology and Diagnosis of Leprosy," by S. P. Impey, M.D.; "The Eye Complications of Leprosy," by D. J. Wood, M.B., C.M.; "Surgical Treatment of some Eye Affections in Leprosy," by A. Heymans, M.D.; "Notes on the Specific Treatment of Leprosy by means of a Cultural Extract," by T. Sydney Davies, M.R.C.S., L.R.C.P.

"Indian Medical Gazette," vol. xlviii, No. 7, July, 1913.

Malaria.—Lalor believes he has found some unusual forms of malignant malaria parasites in an endemic blackwater fever centre in Burma. The forms were found in children's blood. A coloured plate is given showing the supposed peculiarities.

"Indian Medical Gazette," vol. xlviii, No. 7, July, 1913.

Malaria in the Andamans.—Woolley notes that among the various forms of malarial fever met with in the Andamans there is a form associated with marked jaundice. In favourable cases this tends to improve in five or six days, and the temperature may come down to normal. The stools which have been white, and the urine which has been very dark during the jaundice, return to the normal conditions, but the brunt of the disease seems to fall on the circulatory system, and though the dangerously rapid and weak pulse may improve in volume at this time, it often remains unusually rapid, 115–120, for some days.

The prognosis is bad, 40 per cent. of the cases dying, mostly from cardiac syncope.

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THE JOURNAL OF

Tropical Medicine and Hygiene

AUGUST 15, 1913.

BRITISH MEDICAL ASSOCIATION.

(*Continued from p.* 234.)

Enteric Fever.

FROM records of 133 cases of enteric fever occurring in 69 men and 64 women in the following countries: India, 77; China, 26; North Africa, Egypt and Syria, 11; Persia, 6; under 5 in South Africa, Ceylon, Japan, South America, Bahamas, Spain; the following are the statistics:—

Years of service abroad	1	2	3	4	5	6	7	8	9	10	10-15	15-20	20-30
Cases, 133	29	14	21	11	12	6	3	7	4	8	13	3	2

In first 3 years ... 64
In first 5 years ... 87

In a series of 54 cases of deaths from enteric also collected from these sources:—

	Deaths.												
Years of service	1	2	3	4	5	6	7	8	9	10	10-15	15-20	20-30
Cases, 54. (Men 33, women 21.)	15	9	4	2	4	4	4				7	3	2

In first 3 years ... 28.
In first 5 years ... 34.

Period of service.	Incidence of enteric. Per cent.	Deaths from enteric. Per cent.
Within first 3 years	48·1	51·9
,, ,, 5 ,,	65·4	62·9
,, ,, 6 ,,	70·0	70·3

It is noted that cases do occur even after 20 to 30 years of service.

The conclusion is obvious:—

(1) All persons going abroad should have knowledge as to the usual modes of infection by this disease.

(2) The general practice of inoculation with anti-typhoid vaccine should be carried out every three years if possible for most, but not all countries, especially China, India, N. Africa and Palestine.

Tuberculosis.

Pulmonary tuberculosis comes third in order of frequency in China, and seventh in India as a cause of invaliding, whilst occasional cases occur from other countries. This would not be remarkable had there not been by process of medical examination an elimination of susceptible persons, though it must be owned some societies are less strict in their medical regulations than others as regards this disease.

Countries.—China (North excluded, except in two cases)	21
India	6
S. America and S. Africa, Madagascar, Turkish Arabia, West and East Indies	3 each
Family predisposition (tuberculosis in one or more members) was stated in	11
No record of predisposition was stated in	22
Healthy family histories stated in	4
Reported "healed tubercle" before going abroad in	2

This shows that in 33 per cent. of those invalided for tuberculosis there was a decided family predisposition or direct earlier personal infection. This percentage might have been higher had details been afforded in the other 22 cases.

Colonel R. J. S. Simpson, C.M.G., said that the materials used in order to ascertain the causes of invaliding in the Tropics were the Army Medical Reports from 1886-1895, 1896-1905, and 1906-1910. The numbers invalided per 1,000 of strength over each of these periods have been compared. These three periods correspond fairly well to three stages in the development of our knowledge of the causes of disease, and therefore with our ability to deal with them by hygienic measures.

There is difficulty in finding some standard by which to measure the results at any given station, and the only method is to compare groups of diseases at the whole of our foreign stations, but here we are hampered by the great variations in the populations exposed: in some of the smaller stations an accidental small increase in the number of cases results in an unduly large increase in the ratio, even over a period of five years. Again, in India, since 1907, men have been sent to the hills instead of being invalided home, which has reduced the temporary and permanent invaliding since that year.

Invaliding due to Tropical Disease.—The *temporary invaliding* average of the ratios per 1,000 for all foreign stations for *all diseases* between 1906-10

was 24, of which 8 were due to *tropical disease*—usually malarial fever.

The *permanent invaliding* average of the ratios at the same stations for the same period was, for *all diseases*, 9·2 per 1,000, and for *tropical diseases* 0·25.

In India, between 1907-1911, both inclusive, the following were the actual numbers of cases invalided permanently for tropical disease: Enteric fever, 21; beriberi, 4; dysentery, 1; kala-azar, 3; malaria, 18; or a total of 47 cases in five years on an average strength of about 72,000 men.

It is surprising to find how few cases are invalided for dysentery, hepatitis, enteritis, or diarrhœa.

Debility holds a comparatively high place in the tables. This term, like anæmia, really includes many of the cases due to acute or recurrent disease, and should be recorded under that heading. But, even including all cases of debility and anæmia with the tropical diseases (which is, of course, not correct) the total still remains insignificant among the causes of permanent invaliding.

Invaliding due to Non-Tropical Disease.—The more important diseases causing temporary or permanent invaliding are, in order of magnitude, these:—

Temporary.	Permanent.
Tropical diseases.	Nervous and mental diseases.
Nervous and mental diseases.	Tubercular disease.
Unnamed diseases.	Diseases of special senses.
Tubercular disease.	Heart and circulation.
Diseases of special senses.	Unnamed diseases.
Heart and circulation.	

The predominance of nervous and mental diseases is distinct. Of those sent home, 85·5 per cent. are finally discharged. The commonest forms of disease are epilepsy, melancholia, and delusional insanity. In India, between 1907 and 1911, of the total permanent invaliding for mental diseases, epilepsy accounted for 23 per cent., melancholia 21 per cent., delusional insanity 17·5 per cent., altogether 61·5 per cent.

Neurasthenia is not recorded frequently among the men, perhaps less frequently than it might be.

Tubercular disease is for practical purposes tubercle of the lung.

South China and Ceylon showed a definitely higher rate for tuberculosis than any other foreign station during the period 1906-1910.

Diseases of the special senses are almost entirely those of the eye (errors of refraction) and ear (middle ear). In India, during the period 1907-1911, of the total permanent invaliding under this head, 19·3 per cent. was due to refractive error, 53·5 per cent. to diseases of the middle ear, or a total of 72·8 per cent.

An appreciable part of the invaliding for non-tropical diseases would appear, therefore, to be due on the one hand to congenital structural defects, which are not influenced to any great extent by a tropical environment, and, on the other, to antecedent infection or to that aggregate of partially known qualities which we call predisposition.

Relation between Temporary and Final Invaliding.—There is a comparatively close agreement between the order in which the different stations appear when placed in series according to the magnitude of the ratios for temporary and permanent invaliding respectively. So that the temporary invaliding from a station is a fair indication of what permanent loss may be expected.

Relation between Invaliding for Tropical and Non-Tropical Disease.—It is interesting to inquire how far statistics support the general impression that a tropical environment influences the incidence and severity of non-tropical diseases, as far as this is shown by invaliding.

Arranging the foreign stations in two series in order of magnitude of the invaliding ratios for tropical and non-tropical diseases, we find a very strong resemblance between the two series. Hence we are justified in saying that the invaliding rate for non-tropical disease on the whole rises and falls with that for tropical disease; or, putting it another way, at most stations the relative magnitude of the invaliding ratio depends on all classes of disease, not only on that for tropical disease.

The important question here is whether this rise in non-tropical disease, with an increase in tropical disease, is determined by co-existing and antecedent tropical infection, or whether it is the result of other factors. One knows, as a matter of fact, that as cases are invalided for the more important disorders, many cases invalided from infective stations for non-tropical disease also suffer from some tropical infection, and in a good many cases this has increased the severity of the non-tropical disorder.

Using the ratio per 1,000 of invalids sent home during the decade 1886-1895 as a standard, we have the following comparison:—

	Invalids sent home.	Finally discharged.
1886-95 ...	... 100	... 53
1896-1905	... 134	... 56
1906-1910	... 70	... 31
1911 ...	... 30	... 26

The rise in the period 1896-1905 is due to the South African War, while part of the decrease in the last quinquennium is due to the policy of sending men to the hills instead of home, also during the last period there was a very great reduction in venereal disease. But the increase and decrease in each group of diseases is fairly regular over the different periods. Hence the conclusion that those conditions which influence the prevalence of tropical disease also influence the prevalence of non-tropical disease is supported by the statistics available.

Comparing these different periods, and comparing the different foreign stations for the same period with the United Kingdom, one sees that the same diseases are numerically important in temperate as well as tropical stations and that the only difference is in degree not in kind.

Conclusions.—(*a*) Tropical diseases of themselves produce only a relatively large temporary invaliding. (*b*) The temporary invaliding from a station

for causes other than tropical disease, taken generally, rises and falls over the whole of our foreign stations with the invaliding for tropical disease. (*c*) The important causes of invaliding, temporary and final, are in order of importance: Nervous and mental diseases; tubercular disease; diseases of the special senses, including the eye; diseases of the heart, functional and organic. (*d*) These are the same causes which are effective in Great Britain and almost in the same order.

Dr. Law's observations were based on work done in British Guiana, which was confined to no particular class, but included Government officials, employees on sugar plantations, business men and their families. If it is admitted, as most do, that the white races are unfit for permanent residence in tropical countries, it follows logically that Europeans who go to these countries must return to temperate climates at more or less regular intervals if they are to maintain their health and energy for work. There are some apparent exceptions to this rule, but they are few.

The primary cause of invaliding is climatic; it is the *unpreventable* factor that comes into the great majority of cases.

He states that his views on this point are not in agreement with those of some distinguished workers, notably Colonel Gorgas, who is quoted by Dr. David Thomson, in a paper recently read before the Society of Tropical Medicine and Hygiene, as saying that "the work on the Isthmus will demonstrate to the world that the white man can live and work in any part of the world, and that the settling of the Tropics by the Caucasian will date from the completion of the Panama Canal.

He maintains that, though Colonel Gorgas's brilliant work on the Isthmus of Panama has shown how much can be done by energy and organization, there is, on the contrary, every reason to believe that, even if all tropical diseases were wiped out, climate would still remain a powerful enemy to the settlement of tropical countries by the Caucasian.

Apart from climate, by far the most fertile source of invaliding in British Guiana is malaria, which accounts for nearly three-fourths of the temporary invaliding and is an important element in bringing about permanent disability. The disease is, indeed, so common that it is treated with too little respect. People often get what we familarly term "a touch of fever" without lying up at all, or do so for at most a day or two. This accounts for many recurrences, and it is well to emphasize the fact that invaliding, both temporary and permanent, would be less if after every attack, no matter how slight, rest for a day or two and continued use of quinine were looked on as essential.

Dysentery and enteric fever are, perhaps, the only other acute diseases deserving of notice as causing any special invaliding. In our towns and on sugar plantations the former is certainly not common, though a few cases do occur. It is more in evidence amongst the few Europeans who work in the interior at gold diggings or on timber grants.

Enteric fever, which was formerly a very rare disease, has within the last ten or twelve years become comparatively common in Georgetown and on some sugar estates, and the amount of invaliding from this cause is becoming considerable, if not alarming.

Blackwater fever we see little of; yellow fever has been absent from the Colony since 1888; plague, cholera, and beriberi are unknown; and the trypanosome has not yet visited us. Filariasis and intestinal parasites, though extremely common amongst our working classes, are practically absent from our European population.

Nervous disease is next, perhaps, to malaria the most frequent cause of prolonged or permanent

Invalids sent Home per 1,000. 1906—1910.

	Gibraltar	Malta	Egypt	Bermuda	Jamaica	West Africa	South Africa	Mauritius	Ceylon	South China	North China	Straits Settlements	India
Tropical	0·73	6·20	1·48	0·16	3·68	30·36	0·65	40·78	2·63	8·84	0·51	3·99	3·03
Rheumatic fever	0·41	0·38	0·30	0·32	0·46	2·83	0·58	0·76	0·44	0·34	0·51	0·15	0·29
Tubercle	2·42	2·00	1·59	2·41	1·84	—	0·97	0·95	5·26	2·94	0·51	1·84	1·26
Venereal	0·57	0·41	0·53	0·65	—	3·89	0·45	1·13	1·32	1·58	0·77	4·14	0·86
Debility	0·26	0·67	0·87	0·16	1·84	4·67	0·44	2·64	2·63	1·13	0·51	3·53	1·52
Nervous and mental	2·53	2·25	2·69	2·41	2·76	8·56	1·61	1·89	3·07	2·15	1·28	1·84	1·85
Special senses	2 16	1·23	1·35	1·45	0·46	—	0·74	1·52	2·20	0·34	1·79	7·50	1·70
V.D.H. and D.A.H.	1·24	1·30	2·73	1·13	3·68	0·78	1·31	1·51	0·44	3·97	0·77	0·62	1·87
Inflammation of liver	—	0·10	0·38	—	—	0·78	0·26	1·70	0·88	0·68	0·26	—	0·75
Digestive	0·46	0·13	0·83	0·65	1·38	2·33	0·63	2·27	0·44	1·13	0·26	0·61	0·63
Urinary	0·57	0·32	0·53	0·32	0·46	—	0·37	0·94	0·44	0·57	0·26	0·46	0·30
Locomotion	0·31	0·48	0·83	0·65	0·92	—	0·36	0·57	—	0·68	0·51	0·61	0·62
Unnamed	2·01	1·33	2·07	1·61	2·32	3·39	1·02	3·86	2·61	4·99	2·79	2·17	1·64
Totals	13·67	16·80	16·18	11·92	19·80	57·59	9·39	60·52	22·36	29·34	10·73	27·46	16·32

Malarial fevers predominate in Jamaica, West Africa, Mauritius, South China, Straits Settlements and India; dysentery in Ceylon; Mediterranean fever in Malta.

invaliding. It is not so much that the lesions are grosser, involving the locomotor system, as that the so-called functional derangements, varying from mere nervous irritability or slight mental depression to actual melancholia with suicidal tendency. These are mostly to be found in persons occupying responsible positions, such as heads of departments, professional men, managers of estates and business men. Heavy work of a responsible nature is not easily borne in the trying conditions of tropical life and frequently leads to the condition commonly spoken of as "nervous breakdown." In British Guiana we see a great deal of this; possibly our low-lying country, with its constant moist heat, is favourable for its development. Be the cause what it may, we know that when the placid man becomes nervous and irritable, or when mental depression takes the place of the usual cheeriness, the sooner that individual goes for a good long leave to a temperate climate the better.

Valvular disease of the heart is not more common than in England, possibly less so owing to the total absence of acute rheumatism, but still heart affections figure largely amongst the causes of invaliding, being, perhaps, next in importance to nervous diseases. The term "tropical heart" has been used by some writers, but I do not think there is any condition of the heart peculiar to the Tropics. A weakening of the heart muscle, accompanied by a greater or less degree of dilatation, very frequently follows attacks of acute disease, just as it will in this country, but the point seems to be that it takes less to produce this condition in a tropical than in a temperate climate.

Anæmia as a cause of invaliding must also be mentioned. A great deal of it, due to intestinal parasites, is met with in British Guiana amongst the labouring population, but amongst Europeans this is extremely rare, and in this class the condition must be ascribed chiefly to climatic influences and malarial fever.

Strain of work is not unfrequently overlooked by writers who seem to think that life in the Tropics is mostly one of comparative ease and luxury. Few Europeans are capable of as much work in a hot climate as at home, and yet they are not uncommonly called on to do more. Little wonder that breakdown occurs.

Speaking generally, it may be said that the abuse of alcohol is not greater in British Guiana than in England, but its effects are more rapid and serious. It is not a question of actual drunkenness, which is rare, but the habitual free use of alcohol which stops far short of intoxication. The climate is to blame for much of the over-indulgence of this sort.

To epitomize the conclusions drawn from his experience, Dr. Law considers that permanent invaliding is most frequently demanded in cases of nervous disease, heart affections, and obstinate anæmias, whereas temporary invaliding, *if of sufficient duration*, will, as a rule, set right an otherwise healthy person suffering from malaria, enteric fever, dysentery, or other acute disease. He lays particular stress on the qualification in the last sentence, as he has so often seen men, particularly overseers and junior officials, who, perhaps, could ill afford long leave, go home for two or three months after severe malarial fever, only to be laid up again by serious recurrences immediately after their return to the Tropics.

Dr. Law concluded by remarking that more attention to early symptoms, particularly with regard to slight malarial attacks, is required. In malarial countries the regular daily use of quinine as a prophylactic is a necessity. Longer rest after acute malarial attacks have passed off. Longer leave to temperate climates when such is needed. Fairly frequent return to temperate climates even in the absence of acute illness. Great caution with regard to the use of alcohol. Careful selection of candidates for work in the Tropics.

Annotations.

Chronic Dysentery cured by Emetine.—Verteuil reports a case (*Lancet*, June 28, 1913) of amœbic dysentery of three and a half years' duration rapidly cured by injections of emetine hydrochloride.

The patient, a Frenchman, aged 44, left France for Panama in 1909, where he was to represent an important French firm. Previous to this he had always enjoyed excellent health, and was a strong, powerfully built man. Two months after his arrival in Panama he suffered from a sharp attack of dysentery with passage of mucus and bloody stools. From January 1 to April, 1910, he was constantly ill, suffering from fever and diarrhœa. Besides various other drugs he was dosed with quinine. As he was rapidly going downhill he was advised to leave immediately for France. Immediately on his arrival in Paris (April 21) he was operated on for a huge liver abscess. Three months after this operation he felt fairly well. This period of comparative health was, however, of short duration, for as soon as he attempted to return to a normal diet he had a recurrence of his dysenteric symptoms, and had to confine himself to a strict milk diet. During the following two and a half years he had six severe subacute attacks. These attacks would last for several weeks. Two of them were followed by liver abscess, for which he underwent two further operations.

In April, 1913, the patient arrived in Vancouver, where shortly after his arrival he had a subacute attack, and consulted Verteuil for this. He had an urgent and constant desire to go to stool, and he was passing from twenty to thirty stools daily, the majority of which consisted of only a little mucus and blood, accompanied by a good deal of griping and tenesmus. There were pain and tenderness over the region of the colon. He had a slight evening rise of temperature, and also suffered from

external hæmorrhoids, which had apparently been caused by the constant straining at stool. The patient appeared a complete nervous and physical wreck; he was thin and emaciated, with a muddy, icteric-looking complexion, prominent cheek bones, and with sunken eyeballs. He received an injection consisting of ⅓ gr. of emetine hydrochloride dissolved in saline solution and enclosed in a glass ampoule (Burroughs and Wellcome) on May 10. On the following day at *noon* he received a second injection. During the night of the 11th he had no call to stool; previously he had to get up seven or eight times during the night. On the 12th, 36 *hours* after the first injection, he received a third injection, and from that date there was a complete disappearance of all dysenteric symptoms. That day he had but one stool, which was quite normal in appearance. He subsequently received seven more injections as a matter of precaution. During the time he was receiving the emetine injections no other drug or treatment was used. The injection of the drug did not cause the slightest unpleasant sign or symptom.

Verteuil thinks it is too early to speak of a permanent cure in this case, but the results obtained have appeared to him to be so extraordinarily rapid that he has described the case in some detail. There are few specific drugs in medicine, and the addition of a new one is certainly an epoch-marking discovery. Emetine seems to be as potent a specific in amœbic dysentery as quinine is in malaria or salvarsan in syphilis and yaws.

Malarial Pigment as a Factor in the Production of Blood-picture of Malaria.—Brown, writing on this subject in the *Journal of Experimental Medicine*, vol. xviii, No. 1, July, 1913, concludes that malarial pigment, termed by him hæmatin, plays a part in the production of the blood-picture of malaria. He concludes that:—

(1) Doses of less than six milligrammes of hæmatin and, under certain conditions, larger doses may cause a slight rise of blood-pressure.

(2) That large doses of hæmatin cause a profound and prolonged fall of blood-pressure. The principal factor in this fall of blood-pressure is the marked dilatation of the splanchnic vessels. The splanchnic dilatation either does not occur at all or but very slightly if the splanchnic nerves are cut. The splanchnic dilatation is partly compensated for by a marked constriction of cutaneous vessels, and it seems probable that the cutaneous constriction is active and not simply passive to the splanchnic engorgement.

(3) That hæmatin acts upon the cardio-inhibitory centre causing a marked slowing of the rate of the heart-beat, and in large doses produces a typical vagal pulse or even marked irregularities in the amplitude and rhythm of the pulse. Under hæmatin the heart at first shows great loss of tone, but later the tone increases beyond the normal. The cardiac output for a time is greatly diminished.

(4) That in the large doses employed by him hæmatin depresses the respiratory centre, and that death under hæmatin is due to paralysis of this centre.

Sleeping Sickness.—Hearsey, in his "Sleeping Sickness Diary for the Nyasaland Protectorate," Part xx, dated April 30, 1913, states that twenty cases of sleeping sickness have been reported during the past four months, namely, seven in January, six in February, five in March, and two in April. Of this number nineteen were found in the sleeping sickness area, and one near Kota-Kota, in the Marimba district. These twenty cases added to those previously reported make a total of 128.

Clearing of bush and scrub and the lopping of branches of trees which might afford shelter for tsetse-flies are being carried out around all the villages in the sleeping sickness area, and Dr. Conran, the Medical Officer now in charge of this area, reports that the work is attended with marked success in banishing the flies from the villages.

A re-investigation of the districts to the north and south of the proclaimed area will shortly be undertaken, as it is necessary to ascertain definitely whether these localities harbour cases of sleeping sickness.

A detail account of the new cases is given in the report.

The Health of the Canal Zone.—Phillips, Acting Chief Sanitary Officer of the Isthmian Canal Commission, in his report of the department of sanitation for the month of May, 1913, states that the total number of deaths from all causes among employees was 38, divided as follows: Disease 27, and violence 11, giving the annual average per thousand of 5·42 and 2·21 respectively.

Among employees for the month of May of each year the annual average death-rate per thousand was as follows:—

Year	Total	Disease
1904	5·35	—
1905	16·65	—
1906	24·79	23·88
1907	30·15	24·00
1908	10·44	8·03
1909	9·45	5·36
1910	7·72	4·77
1911	10·89	8·17
1912	8·01	4·61
1913	7·63	5·42

The annual death-rate per thousand in the cities of Panama and Colon, and the Canal Zone, including both employees and civil population for the month of May of each year, was as follows: 1905, 41·95; 1906, 43·32; 1907, 31·57; 1908, 20·87; 1909, 15·77; 1910, 18·69; 1911, 22·32; 1912, 19·01; 1913, 19·66.

In segregating according to race, the annual average death-rate per thousand from disease among employees was: For whites 3·65, and for blacks, 5·92,

giving a general average for disease of 5·42. For the same month during 1911 the annual average death-rate per thousand from disease among whites was 5·81, and blacks 8·97, giving a general average of 1·17; and in 1912 from disease among whites 1·95, and blacks 5·50, giving a general average of 4·61.

Among employees during the month deaths from the principal diseases were as follows: Dysentery, 1; hæmoglobinuric fever, 1; lobar pneumonia, 5; organic disease of heart, 3; tuberculosis of lungs, 1; typhoid fever, 2; leaving 14 deaths from all other diseases and 11 deaths from external violence.

During the month of April the Culebra Hospital and sick camp were discontinued, the dispensary alone being continued.

No cases of yellow fever, small-pox, or plague originated on or were brought to the Isthmus during the month.

Experimental Production of Pellagra in a Monkey.—Harris (*Journal of the American Medical Association*, June 21, 1913) believes he has experimentally produced pellagra in a monkey. He states that the inability to produce pellagra satisfactorily in animals by means of various foodstuffs (spoiled maize and other cereals), which are considered by many observers to be in some manner responsible for the production of the disease, led him to investigate the hypothesis that pellagra is caused by a living micro-organism and not by a chemical intoxicant. It seemed logical, therefore, that the causal agent would be contained in one or more of the various tissues affected, and by utilizing these the disease could be reproduced in a susceptible animal. It was considered inadvisable to attempt injections of the whole tissue emulsions because of the heavy bacterial flora of the intestinal tract, the contaminations of the skin, and the probable secondary infection of the patient dead of pellagra. These considerations, together with the view that the disease in man might be due to a filterable virus, occasioned the employment of filtrates from the various organs. For this purpose the skin, alimentary tract, and more especially the brain and cord—since many of the characteristic symptoms of pellagra indicate disorders of this system—were filtered and utilized for animal injection.

In the spring of 1910 experiments with a Berkefeld filtrate of the infected human tissues were carried out on the monkey. These materials were selected from the fresh necropsy of a case of undoubted pellagra which presented clinically a typical picture of the disease, namely, extensive skin lesions, stomatitis, diarrhœa and the various nervous manifestations. The skin lesions involved the hands, face, legs and scrotum, and were sharply defined, being of a distinct black colour, dry, elevated and scaly. A complete necropsy was held within two hours after death, and the only lesions found macro- and microscopically were those present in fatal pellagra; no concomitant disease was present. The tissues of the different parts of the central nervous system, especially the cord, portions of the skin lesions and of the alimentary tract, including the nasopharyngeal mucous membrane, were removed. These were mixed with equal amounts of normal saline solution, ground together in a mortar and allowed to stand in the ice-chest over night. After coarse filtration the juice was passed through a Berkefeld filter, letter N.

The filtrate from the tissue mixture was then injected in large quantities into monkeys and produced in them symptoms closely resembling pellagra. Photographs of the infected animals showing lesions on their hands and face are given, and these bear a resemblance certainly to the analogous skin lesions seen in man.

Harris believes it is pellagra, and sums up his work thus:—

"These experiments would indicate that pellagra may be transmitted to the monkey (*Macacus rhesus*) by means of a Berkefeld filtrate derived from the tissue of the human subject; at least, the animals develop all the essential clinical signs and symptoms together with the pathologic picture discerned in the disease in man. Furthermore, they suggest that the etiology of pellagra is a filterable virus or a micro-organism capable of passing through the pores of certain Berkefeld filters. The details of this work and the further experiments which have been undertaken with a view of determining the nature of this filtrate and other phases of the problem will appear in a subsequent publication."

The Prevention of Enteric Fever in Military Service.—Cummins, in the *Journal of the Royal Army Medical Corps*, No. 1, July, 1913, vol. xxi, writing on this subject, deals specially with the typhoid carrier.

He believes that the discovery and disposal of chronic carriers should be carried out in peace in order that the Army may take the field with as few "carriers" as possible within its ranks.

The procedure that should be followed throughout the Army has been already initiated in India. It seems illogical that the splendid work of the Enteric Convalescent Depôt at Naini Tal should not have already led to the formation of similar institutions outside India. The author recommends that in all foreign stations where the garrison exceeds a certain strength—say 2,000 troops—there should be a depôt for enteric convalescents under the charge of a "specialist" officer, trained in the bacteriological study of enteric fever. This officer should be regarded as the pathologist of the command also, where the work of the depôt is not so heavy as to justify a whole-time worker. To deal with convalescents from foreign stations with garrisons below this strength there should be a "Home Depôt" at some such place as Netley, to which all enteric convalescents should be sent. This station would also dispose of "carriers" sent home from the other depôts, and receive convalescents from military hospitals in England. The duties of this central Home Depôt would

be arduous, and would require the whole time of one officer, under whom the clinical pathologist at Netley might serve as an assistant when available. He would further recommend that all "temporary" and "chronic" carriers regarded as cured and returned to the ranks should be "followed" during at least a year after return to duty, samples not only of fæces, but of blood being sent either to the depôt at Netley or the Royal Army Medical College for examination. Where "immune bodies" were found to persist for many months in the blood, the soldier should be invalided. A negative result in a sample of fæces sent by post means very little where twenty-four hours or more have elapsed since it was passed; on this account a blood sample would be advisable. No enteric convalescent should return to the ranks without having passed a period at a convalescent depôt and being certified as no longer excreting germs.

As regards the detection of early, atypical, and abortive cases in peace, this should be, and is, fairly successfully carried out. It is another matter on active service. Cummins believes that there is too great a tendency to regard bacteriological work as "out of place" on actual active service. There is no sanitary measure more important to a commander than the early diagnosis of enteric fever cases. If this is successfully carried out, and the methods of observation and isolation of "contacts" laid down in "R.A.M.C. Training" are honestly and thoroughly observed, he sees no reason why enteric fever should prevail in the future to anything like the extent that it has done in the past on active service.

The early diagnosis of typhoid fever is a matter of blood culture. This requires skill, care, and deliberation, but not an elaborate outfit of bacteriological appliances. His idea is that a mobile "laboratory," consisting of a closed motor vehicle, containing the apparatus for preparing media, incubating "cultures," and for the necessary microscopic and other work of isolating bacteria, should be attached to each division and accompany this formation as part of the Divisional Headquarters. A specially trained officer with two trained orderlies and a driver should constitute the staff. Regimental medical officers and officers commanding field ambulances should be directed to cooperate with this officer by sending to him all suspicious cases for blood culture and such other work as may be necessary. At present this work is allocated to the laboratory at the advanced base or railhead. In place of this, Cummins suggests a mobile laboratory marching and working with the divisions.

During active operations, convalescent enteric cases should invariably be invalided to home territory, and should not rejoin the Colours until certified "safe" by the Central Home Depôt. The numbers so invalided would be comparatively few if the measures already mentioned had been thoroughly carried out.

Abstracts.

KALA-AZAR, ITS DISTRIBUTION AND THE PROBABLE MODES OF INFECTION.*

By Lieutenant-Colonel C. Donovan, B.A., M.D., B.C.H., B.A.O. (R.U.I.), F.L.S., F.E.S., I.M.S.
Surgeon, 4th District, Madras.

The author gives a brief account of the geographical distribution of the disease to show the nature of the localities in which it is endemic. Its occurrence in such places, he believes, may help to throw a sidelight on some of the factors needed towards the discovery of the infective agent. He then describes the different insects that have been suspected as carriers of the virus, and the possibility of infection by means of or through the mucous membrane of the intestinal tract.

Geographical Distribution.—Outside India, there are records of the prevalence of the disease in China, in the Yangtse Valley, and in the Soudan, in localities on the Blue Nile bordering the western boundary of the Abyssinian plateau.

The author excludes the disease as found along the littoral of the Mediterranean, relegating it to another form of Leishmaniasis, affecting mainly, if not exclusively, children and apparently closely connected with the canine form of the disease.

As regards the occurrence of kala-azar in India, it is found endemic in the damp, low-lying districts near the deltas of the Ganges and Brahmaputra; for instance, at Purneah, Dinajpur, Rangpur, the Burdwan district, Jessore, in and about Calcutta, Garo Hills and up the valley of the Brahmaputra river in Assam.

Donovan is doubtful if Orissa is affected, but would suspect the low-lying areas of the deltas of the Brahmani and Mahanadi rivers, especially near Cuttack, to be suitable localities. Cases occurring in other parts of the north of India are apparently not indigenous. Dr. Row's case of kala-azar from Baroda is an exceptional instance, but perhaps others may be discovered there when more searching inquiries are made.

As far as the Madras Presidency is concerned, the disease is endemic in Madras City, especially in the northern congested part, *i.e.*, Georgetown and Royapuram; to the west there are smaller foci in Choolai, Vepery and Pursewalkum, and to the east a very small focus in Triplicane. Recently a single case has been discovered in the family of a servant employed by a European residing at Nungumbakam, the residential part of Madras for Europeans. In the *mofussil*, three cases have been traced to Madura and a couple to Negapatam and Cuddalore.

Thus all the places where this disease is endemic are low-lying, damp and near rivers, places very

* Proceedings of the Third Meeting of the General Malaria Committee, held at Madras, November 18, 19, and 20, 1912. Simla: Government Central Branch Press, 1913.

suitable for malaria, and here malaria and kala-azar co-exist.

Probable Modes of Infection.—These may be divided into two: (1) By means of insects, &c., absorption of the infection by the cutaneous lymphatics, and (2) by oral ingestion, infection through the mucous membrane of the intestinal tract.

(1) *By Insects*—(*a*) *Bed-bugs.*—Patton has brought very strong evidence to bear on the transmission of the disease by bed-bugs; yet there are several points still wanting to satisfy one in accepting the fact in its entirety. The disease is very local and bed-bugs everywhere. Patton has attempted to explain this anomaly by the fact that a few bugs may take a single meal only of blood, the majority satisfying their appetites more often and not being condemned, for some unaccountable reason, to an unnecessary fast; and that it is in these exceptional cases of single feeds that the Leishmania flourish and flagellate. There may be something in this deduction, but further proofs are required. Patton has done a considerable amount of work in connection with bugs, and can speak with authority, yet an independent confirmation of his findings is required. Donovan himself met with no success, but he has not had an opportunity of trying experiments with the single feeding of bugs. Cases of kala-azar with numerous Leishmania in the peripheral blood, according to him, are of rare occurrence. Subsequent to Patton's announcement of success with single feeds, he has, Donovan understands, fed bugs on a kala-azar patient with nearly a thousand Leishmania in a blood film. Large numbers of these insects were fed on this most exceptionally suitable case, but the results are said to have been negative. Of course, conditions favourable on the first occasion might have been inimical on this the second attempt, for the flagellation of the parasites; for instance, there may not have been a sufficiently large number of Leishmania in the endothelial cells.

(*b*) *Conorrhinus.*—Donovan has suspected another member of the bug family to be a transmitter of the disease, *e.g.*, *Conorrhinus rubrofasciatus.* So far he has not succeeded in obtaining any development of Leishmania in the gut of these Hemiptera, but what makes him still adhere to experiments with them is the fact that they suck human blood under natural conditions, and that another species of the same genus in Brazil is the transmitter of a human trypanosomiasis. The popular belief that this bug feeds on bed-bugs is of curious interest, and a similar belief is held in Europe with regard to its congener, *Reduvius personatus.*

(*c*) *Mosquitoes.*—Patton has carried out a few observations on these insects, but with negative results. It must not be forgotten that some Culicids harbour flagellates and these may very readily be confused, by an inexperienced observer, for Leishmania. A fact to be noted is that where kala-azar is endemic, there too malaria prevails; to give a few instances: in Assam, in Lower Bengal and in Georgetown.

(*d*) *House-fly.*—The ubiquitous house-fly of India, very similar to that of Europe, but singled out for specific distinction as *Musca nebulo*, has been incriminated as acting as a transmitter, not by biting, as it possesses no such apparatus, but by transferring by its mouth or excreta the *materies morbi* on to foodstuffs or on to a breach of surface. This fly has a Herpetomonas of its own and a very distinctive one, in several ways differing from Leishmania. Donovan would place this Herpetomonas of the fly in a different genus, and considers it has no bearing whatsoever with the Leishmania of man.

(*e*) *Lice and Ticks.*—The head and body-lice have undergone a trial at Patton's hands and proved ineffectual as transmitters. Similarly a large tick, *Ornithodorus savignii*, has been put through a like ordeal of sucking the blood of kala-azar patients with no positive results.

(*f*) *Fleas and Dogs.*—In Europe, especially with regard to infantile kala-azar, the dog has been found to harbour Leishmania, and a fairly presumptive case has been made out as to the part this animal plays as an intermediary host, the dog-flea being the actual transmitter. Donovan believes, however, that the evidence adduced so far is not in all respects convincing. The occurrence of a natural flagellate of the flea has evidently not been taken into sufficient account.

As far as the kala-azar of India is concerned, dogs examined in Madras have not afforded any evidence of harbouring Leishmania.

(2) *By Oral Infection.*—Donovan having discussed the different kinds of insects that have been suspected of bringing about infection and spread of the disease, either by biting and so injecting or by depositing the infective material on the skin, next passes to the mouth as another channel by which infection may be possible, Leishmania being ingested by food contaminated by excreta or other substances containing the encysted forms of this flagellate.

In a fairly large proportion of cases of kala-azar, the disease begins with symptoms of intestinal involvement, simulating very closely cases of typhoid fever; the typical pyrexial course, the looseness of bowels and the gradual descent of the fever by lysis on about the twentieth or thirtieth day, presents a picture very like enteric.

After a period of apyrexia for a month or more, the temperature rises again, disillusionment of the diagnosis follows and kala-azar is made manifest. Then, again, in the course of all cases of the disease, there are periods of diarrhœa and dysentery. In fatal cases evidence of ulceration of the large intestines is marked and Leishmania are found in scrapings from these ulcers; involvement of the intestinal tract lends a certain amount of probability for suspecting a primal attack of the parasites on the mucosa of the alimentary system. It is true no Leishmania have been found in the fæces of kala-azar patients. Ankylostomes and Trichomonads are frequent in such evacuations; could these organisms harbour and carry the Leishmania and thereby bring about infection of the intestinal

mucosa? Ankylostomes have been examined by Christophers, but he could find no trace of Leishmania in them. Trichomonads are very commonly found in infusions of earth; for instance, the earth containing intestines of white ants are packed with these flagellates, and again sawdust used in Madras for storing ice, on occasions, affords a good supply of these protozoa. Could Leishmania be a commensal in the cytoplasm of Trichomonas?

Further research on the subject Donovan believes is required.

THE BREEDING PLACES OF PHLEBOTOMUS.*

By Professor F. M. Howlett.
Imperial Pathological Entomologist.

Howlett states that the investigation of the natural breeding-places of sand-flies is by no means easy, owing to the minute size of the larvæ and the fact that their colour harmonizes with that of damp earth. Repeated attempts were made at Pusa to discover whether the breeding-places were restricted to one particular type of locality on which it might be possible to concentrate the application of remedial measures. Experience indicates that no such definite assertions can be made in a district where the climatic conditions are such as obtain at Pusa, although it is probable that breeding-places may be found to be far more narrowly restricted in such areas as the Punjab, where temperatures are higher and humidity low. A certain degree of moisture in the soil is essential to the welfare of the larvæ, they are never found in really dry earth, and are killed by a comparatively short exposure to the dry air of the hot weather. In very dry areas one should thus expect to find them only in those places where there is a reasonable amount of moisture, and the difficulty of finding them would thus be considerably lessened.

Although the number of larvæ found has been small, it is sufficient to show that in Pusa the necessary conditions are:—

(1) A moderate degree of moisture, roughly equivalent to that of good garden mould in England.

(2) Protection from light.

(3) The presence of nitrogenous refuse; particularly the debris of dead insects, decayed fungi, and perhaps insect and other excreta. An excess of nitrogenous matter, however, appears to be distasteful and unsuitable. No larvæ have been hitherto found in latrines, although search has been made on several occasions.

(4) The presence of brick, stones, tiles, or cement has been associated with all but one of the breeding-places seen hitherto; this is probably due to the fact that these substances are comparatively cool and often have condensed moisture on the surface, while they also act as a protection from the light. Grassi has found larvæ in cellars and damp places where there were bricks, and Marett, in Malta, only found them in caves and in the crevices of stone walls, while it has been suggested that they feed exclusively on the excreta of wood-lice. All these observations fit in with the conditions outlined above. The brick-work of wells is indicated as a promising locality in dry districts, though no results therefrom have yet been got at Pusa.

Two other points are worth noting. One is the very frequent association of sand-flies with the common wall-lizards; the flies bite the lizards readily, particularly the young and tenderer individuals, and are often to be seen sitting on or near a lizard; the latter seem to suffer no annoyance from the bite. It is very possible that the cracks and crannies in the walls in which lizards reside during the day are sometimes used by *Phlebotomus* as breeding-places, and the excreta of the lizard, consisting as it does of the remains of digested insects, might provide suitable food for the larvæ, though these have not yet been found in lizards' haunts. The other point is the possible utilization as breeding-places of the nests of termites. The author has twice observed adult *Phlebotomus* in some numbers in the surface-galleries of these nests, but has had no opportunity as yet of pursuing the matter further, as nest-building termites do not occur in the Pusa district. Mr. Fletcher writes that he has observed the same thing while working at termites in Madras, and since the nests would provide just the right conditions as regards moisture, darkness, the presence of nitrogenous refuse, and even the brick-like walls of the galleries, this line of investigation seems a promising one.

The following are the localities from which larvæ or pupæ have been obtained at Pusa:—

(1) The nearly dried mud of cement channel leading from a well-reservoir. *One larva. August.*

(2) A small heap of kitchen refuse near the base of a wall. *One larva. August.*

(3) The damp earth between the bricks forming a small platform for a plant of the sacred *Tulsi*, in the courtyard of a house. The bricks were more or less covered with an algal growth, and among them were found ants, with larvæ and nymphs, wood-lice larvæ of *Mycetophilidæ*, mites and a few nematode worms, together with the remains of numbers of dead insects of various sorts, on which the larvæ were feeding. *Four larvæ and seven empty pupa cases. October.*

(4) Among the bricks and tiles in a small heap of earth and rubbish. The conditions were similar to those in the locality just mentioned, the larvæ feeding on fragments of dead insects. The heap was about a foot high, on a piece of waste land some thirty yards from a block of houses. *Five larvæ, three pupæ, and twenty-three empty pupa cases.* The pupæ were nearly all on the edges of tiles and bricks; they can be recognized by the fact that they stand upright, anchored to the support by the larval skin which remains encasing the

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tail-end. The larvæ (2-3 mm. long) can be recognized by the two or four very long stout bristles at the tail.

(5) The damp algal muddy leafy stuff taken from the earthy sides of an open reservoir where water from several gutters accumulated; the gutters, which were of cement, led from houses and the water contained nitrogenous matter. *Six adults emerged. May.*

Personal Notes.

India Office.

From May 17 to August 4.

Arrivals Reported in London.—Colonel P. Hehir, I.M.S.; Lieutenant-Colonel J. Jackson, I.M.S.; Lieutenant-Colonel F. C. Pereira, I.M.S.; Major T. Hunter, I.M.S.; Captain W. P. G. Williams, I.M.S.; Captain A. J. Symes, I.M.S.; Captain R. D. Saigol, I.M.S.; Lieutenant-Colonel F. R. Ozzard, I.M.S.; Lieutenant-Colonel W. H. Ogilvie, I.M.S.; Lieutenant-Colonel R. H. Elliot, I.M.S.; Lieutenant-Colonel H. S. Wood, I.M.S.; Major A. A. Gibbs, I.M.S.; Major W. H. Cox, I.M.S.; Major G. Hutcheson, I.M.S.; Captain W. C. Ross, I.M.S.; Captain A. E. J. Lister, I.M.S.; Captain R. Kelsall, I.M.S.; Colonel R. W. S. Lyons, I.M.S.; Lieutenant-Colonel C. N. C. Wimberley, I.M.S.; Lieutenant-Colonel G. F. W. Ewens, I.M.S.; Major J. J. Urwin, I.M.S.; Captain G. G. Jolly, I.M.S.; Captain D. P. Goil, I.M.S.; Colonel C. F. Willis, *C.B., V.H.*, I.M.S.; Major A. Leventon, I.M.S.; Major F. N. Windsor, I.M.S.; Lieutenant-Colonel J. Crimmin, *V.C.*, I.M.S.; Major W. H. Cox, *D.S.O.*, I.M.S.; Major A. W. Tuke, I.M.S.; Captain W. S. McGillivray, I.M.S.; Captain W. R. J. Scroggie, I.M.S.; Captain S. G. S. Haughton, I.M.S.; Captain H. M. Inman, I.M.S.; Captain J. H. Horne, I.M.S.; Captain R. S. Kennedy, I.M.S.; Colonel J. Smyth, I.M.S.; Captain A. C. Ingram, I.M.S.; Captain M. F. Reany, I.M.S.

Extensions of Leave.—Captain W. A. Mearns, I.M.S., 2 m.; Major H. R. Nutt, I.M.S., 1 m. 13 d.; Major G. Y. C. Hunter, I.M.S., 3 m., M.C.; Captain F. P. Connor, I.M.S., 10 d.; Major S. R. Christophers, I.M.S., 3 m.; Major R. F. Standage, I.M.S., 2 m.; Captain N. N. G. C. McVean, I.M.S., 6 m., M.C.; Major J. H. Hugo, I.M.S., 14 d.; Lieutenant V. P. Norman, I.M.S., to November 11, 1913, M.C.; Captain C. A. Gill, I.M.S., 4 d.

List of Indian Civil Officers on Leave (including Military Officers under Civil Rules).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Battye, Major W. R., I.M.S., India Foreign, Rajpootana, 7 m., March 31, 1913.
Bird, Lieutenant-Colonel R., C.I.E., M.V.O., I.M.S., B., 6 m., May 9, 1913.
Cox, Major W. H., D.S.O., I.M.S., Burma, 12 m., April 12, 1913.
Elliot, Lieutenant-Colonel R. H., I.M.S., M., 7 m., April 19, 1913.
Ewens, Lieutenant-Colonel G. F. W., I.M.S., Punj., 6 m., May 4, 1913.
Goil, Captain D. P., I.M.S., B., 32 m., April 5, 1913.
Goodbody, Major C. M., I.M.S., Rajpootana, 6 m., March 20, 1913.
Green, Lieutenant-Colonel C. R. M., I.M.S., B. Med., 7 m., April 17, 1913.
Harris, Colonel G. F. A., C.S.I., I.M.S., B. Med., 7 m. 15 d., April 11, 1913.
Hepper, Captain E. C., I.M.S., N.P., 23 m. 26 d., April 27, 1913.
Hunter, Major T., I.M.S., U.P. Med., 9 m. 15 d., April 20, 1913.
Hutcheson, Major G., I.M.S., U.P. Med. Dept., 11 m., April 16, 1913.
Ingram, Captain A. C., I.M.S., M. Med. College.
Jackson, Lieutenant-Colonel J., I.M.S., Bo. Prisons, 14 m., April 18, 1913.
Kelsall, Captain R., I.M.S., Burma, 18 m., April 15, 1913.
Leventon, Major A., I.M.S., Assam, 18 m., May 8, 1913.
Lethbridge, Major W., I.M.S., Rajpootana, 23 m. 2 d., October 13, 1913.
Lindesay, Major V. E. H., I.M.S., Behar and Orissa.
McConaghy, Captain C. B., I.M.S., India Foreign, Persian Gulf.
Penny, Lieutenant-Colonel J., I.M.S., Burma.
Perry, Major E. L., I.M.S., Punj., 7 m. 1 d., March 5, 1913.
Pereira, Lieutenant-Colonel F. C., I.M.S., M., 14 d., April 15, 1913.
Reaney, Captain M. F., I.M.S., C.P.
Ross, Captain H., I.M.S., U.P., 24 m., November 20, 1912.
Ross, Captain W. C., I.M.S., B. Med. Dept., 19 m. 21 d., April 16, 1913.
Saigol, Captain R. D., I.M.S., Burma, 24 m., February 10, 1913.
Stewart, Lieutenant-Colonel T. W., I.M.S., Burma, 24 m., December 14, 1912.
Tuke, Major A. W., I.M.S., Bo., 9 m., May 22, 1913.
Wilkinson, Lieutenant-Colonel E., I.M.S., Punj. Sanitary Comm., 21 m., February 13, 1913.
Windsor, Major F. N., I.M.S., B., 19 m. 29 d., May 9, 1913.
Wood, Lieutenant-Colonel H. S., I.M.S., B., 33 m., February 18, 1913.
Urwin, Major J. J., I.M.S., Behar and Orissa, 18 m., May 14, 1913.

List of Indian Military Officers on Leave.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Baines, Major F. E., I.M.S., to November 15, 1913.
Cox, Major W. H., I.M.S.
Crimmin, Lieutenant-Colonel J., V.C., I.M.S.
Eliot, Lieutenant-Colonel R. H., I.M.S.
Gibbs, Major A. A., I.M.S., to December 13, 1913.
Grayfoot, Colonel B. B., I.M.S., to October 30, 1913.
Haughton, Captain S., I.M.S., to March 5, 1914.
Hehir, Colonel P., I.M.S., to October 16, 1913.
Horne, Captain J. H., I.M.S.
Inman, Captain H. M., I.M.S., to February 17, 1914.
Jolly, Captain G. G., I.M.S., to May 8, 1914.
Kennedy, Captain R. S., I.M.S.
Lister, Major A. E. J., I.M.S., to October 1, 1913.
Lukis, Surgeon-General Sir C. P., K.C.S.I., Director-General I.M.S., to November 12, 1913.
Lyons, Colonel R. W. S., I.M.S., to November 7, 1913.
McGillivray, Captain W. S., I.M.S.
Mearns, Captain W. A., I.M.S., to August 20, 1913.
Ogilvie, Lieutenant-Colonel W. H., I.M.S.
Ozzard, Lieutenant Colonel F. R., I.M.S., to May 9, 1914.
Symes, Captain A. J., I.M.S., to December 2, 1913.
Williams, Captain W. P. G., I.M.S., to December 31, 1913.
Willis, Colonel C. F., C.B., I.M.S., to September 30, 1913.
Wimberley, Lieutenant-Colonel C. N. C., I.M.S., to January 15, 1914.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

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4.—Authors desiring reprints of their communications to the Journal of Tropical Medicine and Hygiene should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

THE METEOROLOGY OF MALARIA.

By MATTHEW D. O'CONNELL, M.D.
Colonel R.A.M.C. (Retired).

BELOW I give hourly meteorological readings recorded by the thermograph (Kew) and anemograph (Beckley's) for a continuous period of forty-eight hours at Calcutta in the season September, when malaria is prevalent, and, for contrast, similar readings in the season March, when malaria is not prevalent. For these readings I am indebted to Gilbert T. Walker, Esq., C.S.I., F.R.S., the Director-General of the Meteorological Observatories of the Government of India. In order to show the effect of such atmospheric conditions on the body temperature of the inhabitants of Calcutta, I have placed in line with each hourly reading, as a standard for comparison, the meteorological conditions which were found by actual observation to raise body temperature above normal in the humid cotton-weaving sheds of Lancashire. In each instance I have added the drying power of the air to indicate the impediment to loss of heat from the body by evaporation.

To estimate the effect of a warm, or hot, damp atmosphere on body temperature, physiologists regard its wet bulb temperature as the most important point. In the evidence given before the Departmental Committee on Humidity and Ventilation in the Lancashire Cotton-sheds, Professor M. S. Pembrey and Dr. Colley, Inspector of Factories, say: "All must have their powers of accommodation taxed when the temperature of the

	Hourly atmospheric conditions at Calcutta (Alipore)				Atmospheric conditions which raised body temperature in the cotton sheds				Degree to which body temperature was raised by exposure in the cotton sheds		
	Temperature of air F.		Drying power of air per 10 c. ft.	Velocity of wind per hour	Temperature of air F.		Drying power of air per 10 c. ft.	Movement of air per hour	Body temperature in mouth	Pulse	Respirations
Calcutta, 1912	Dry	Wet	Grains	Miles	Dry	Wet	Grains	Miles			
March 9, 6 o'c. a.m.	73·3°	71·5°	9·0	0	73·5°	68 0°	24·5		100·0°	90	22
,, 7 ,,	73·3	71·5	9·0	0	73·5	68·0	24·5		100·0	90	22
,, 8 ,,	75·0	72·2	16·0	0	75·0	69·5	26·6		100·2	110	18
,, 9 ,,	78·1	70·9	30·9	3	78·0	73·5	23·0		100·0	100	30
,, 10 ,,	80·3	72·0	41·5	3	80·0	73·0	36·0		99·2	90	16
,, 11 ,,	82·9	73·0	50·5	4	83·0	74·0	47·0		99·8	104	21
,, 12 o'c. noon	84·2	72·0	62·0	4	84·0	77·0	39 0		100·3	84	25
,, 1 o'c. p.m.	85·9	71·0	74·4	4	86·0	77·5	49·0		99·2	80	20
,, 2 ,,	86 9	71·5	78·4	4	87·0	79·0	48·0		100·4	108	24
,, 3 ,,	86·9	71·0	79·5	4	87·0	79·0	48·0		100·4	108	24
,, 4 ,,	88·9	68·5	98·0	7	89·0	76·0	73·0		99·6	98	18
,, 5 ,,	87·1	69·0	86·5	5	87 0	79·0	48·0		100·4	108	24
,, 6 ,,	83·2	70·4	62·0	3	83·0	75·0	43·0		99·3	92	16
,, 7 ,,	79·1	70·1	42·2	1	79·0	73·5	28·0		100·3	110	24
,, 8 ,,	76·8	70·2	31·4	1	77·0	73·0	28·0		100·1	100	18
,, 9 ,,	75·6	70·6	24·6	1	75·5	70·5	24·5		99·4	132	22
,, 10 ,,	74·4	67·7	30·2	1	74·0	70·0	19·0		100·0	98	20
,, 11 ,,	73·1	67·0	26·5	0·5	73·5	68·0	24·5		100·0	90	22
,, 12 o'c. midnight	71·6	67·0	20·4	2·5	72·0	65·0	29·0		99·6	Not given.	
March 10, 1 o'c. a.m.	70·0	67·6	10·6	2	69·0	65·0	17·0		100·0	100	26
,, 2 ,,	69·7	68 0	7·8	2	69·0	65·0	17·0		100·0	100	26
,, 3 ,,	70·8	68·5	11·0	3	69·0	65·0	17·0		100·0	100	26
,, 4 ,,	71·3	68·0	15·2	5	72·0	65·0	29·0		99·6	Not given.	
,, 5 ,,	68·7	66·2	11·5	1	69·0	65·0	17·0		99·6	Not given.	
,, 6 ,,	67·7	63·8	16·6	2	69·0	65·0	17·0		99·6	Not given.	
,, 7 ,,	67·4	64·3	13·4	0	69·0	65·0	17·0		99·6	Not given.	
,, 8 ,,	71·5	66·4	22·4	2	72·0	65·0	29·0		99·6	Not given.	
,, 9 ,,	76·6	62·5	55·9	2	76·0	72·0	29·0		99·4	88	20
,, 10 ,,	79·6	63·9	65·2	4	79·5	74·5	26·5		100·2	90	24
,, 11 ,,	82·6	65·2	74·8	4	82·0	75·0	38·0		99·2	92	16
,, 12 o'c. noon	83·9	65·5	80·0	4	84·0	77·0	39·0		100·3	84	25
,, 1 o'c. p.m.	85·4	64 0	92·0	2·5	85·5	78·0	44·0		100·1	82	22
,, 2 ,,	86·0	65·4	99·4	2·5	86·0	77·5	49·0		99·2	80	20
,, 3 ,,	87·9	65·7	99·4	4	88·0	77·5	61·0		100·2	104	20
,, 4 ,,	88·3	65·5	102·2	6	88·0	77·5	61·0		100·2	104	20
,, 5 ,,	85·4	68·5	79·5	3	85·5	78·0	44·0		100·1	82	22
,, 6 ,,	82·0	69·4	59·8	4	82·0	75·0	38 0		99·2	92	16
,, 7 ,,	77·1	68·8	38·2	2	77·0	73·0	20·0		100·1	100	18
,, 8 ,,	75·3	68·0	38·2	2	75·5	70·5	24·5		99·4	132	22
,, 9 ,,	73·2	66·0	31·0	1	73·5	68·0	24·5		100·0	90	22
,, 10 ,,	71·5	65·5	25·5	1	72·0	65·0	29·0		99·6	Not given.	
,, 11 ,,	71·6	66·0	24·4	4	72·0	65·0	29·0		99·6	Not given.	
,, 12 o'c. midnight	68·7	66·5	10·0	2	69·0	65·0	17·0		100·0	100	26
March 11, 1 o'c. a.m.	69·1	66·5	12·2	2	69·0	65·0	17·0		100·0	100	26
,, 2 ,,	69·2	66·6	11·4	4	69·0	65·0	17·0		100·0	100	26
,, 3 ,,	69·0	66·6	10·6	4	69·0	65·0	17 0		100·0	100	26
,, 4 ,,	69·0	67·0	9·0	3	69·0	65·0	17·0		100·0	100	26
,, 5 ,,	69·2	67·5	7·8	3	69·0	65·0	17·0		100·0	100	26
,, 6 ,,	68·9	67·4	6·9	2	69·0	65·0	17·0		100·0	100	26

No movement of air perceptible.

wet bulb rises much above 70° F. (21·1° C.);" and again "*prolonged* exposure to the hot, moist atmosphere would appear to be more injurious than exposure to even higher (wet bulb) temperatures for a shorter time." Sir T. M. Legge, H.M. Chief Inspector of Factories, says: "The general opinion I have formed from the detailed study of the observations (in the sheds) is that a rise of mouth temperature makes itself distinctly felt when the wet bulb (temperature of the air) exceeds 75° F. (23·7 C.)."

	Hourly atmospheric conditions at Calcutta (Alipore)					Atmospheric conditions which raised body temperature in the cotton sheds					Degree to which body temperature was raised by exposure in the cotton sheds		
	Temperature of air, F.		Drying power of air per ten c. ft.	Velocity of wind per hour		Temperature of air, F.		Drying power of air per ten c. ft.	Movement of air per hour		Body temperature in the mouth, F.	Pulse	Respiration
Calcutta, 1912	Dry	Wet	Grains	Miles		Dry	Wet	Grains	Miles				
September 21, 6 o'c. a.m.	79·9°	78·5°	7·9	1		79·5°	74·5°	26·5			100·2°	90	24
,, 7 ,,	81·4	80 0	8·4	0	A	81·0	74·0	37·0			99·9	120	20
,, 8 ,,	83·5	80·4	18·6	2		83·0	75·0	43·0			99·3	92	16
,, 9 ,,	86·0	80·5	34·0	6		86·0	77·5	49·0			99·2	80	20
,, 10 ,,	87·4	81·5	35·0	5		87·2	76·0	63·0			100·4	100	20
,, 11 ,,	88·4	81·1	45·8	5		88·0	80·0	49·0			100·0	108	16
,, 12 o'c. noon	90·4	81·3	54·5	6		90·0	75·0	82·0			99·8	94	24
,, 1 o'c. p.m.	88·9	78·0	64·4	7		88·0	77·5	61·0			100·2	104	20
,, 2 ,,	87·0	77·5	55·0	7	B	87·0	79·0	48.0			100·4	108	24
,, 3 ,,	88·5	81·6	43·9	5		88·0	80·0	49·0			100·0	108	16
,, 4 ,,	85·7	79·5	38·4	8		85·5	78·0	44·0			100·1	82	22
,, 5 ,,	84·5	78·5	36·0	5		84·5	77·5	41·0			100·3	130	25
,, 6 ,,	83·4	78·5	28·8	5		83·0	75·0	43·0			99·3	92	16
,, 7 ,,	81·6	76·7	27·1	3		81·5	75·5	32·5			100·2	112	31
,, 8 ,,	81·6	77·5	23·6	2		81·5	75·5	32·5			100·2	112	31
,, 9 ,,	81·2	77·5	21·2	2		81·0	75·0	32·0			100·0	112	31
,, 10 ,,	80·9	77·6	18·5	1		80·5	73·0	38·5			99·6	92	20
,, 11 ,,	79·7	77·6	11·6	1		79·5	74·5	26·5			100·2	90	24
,, 12 o'c. midnight	80·2	78·0	13·0	1		80·0	75·0	27·0			99·2	92	28
September 22, 1 o'c. a.m.	80·1	78·0	13·5	1·5		80·0	75·0	27·0			99·2	92	28
,, 2 ,,	79·8	77·9	10·0	1	C	79·5	74·5	26·5			100·2	90	24
,, 3 ,,	79·2	77·6	8·6	1		79·0	73·5	28·0			100·3	110	24
,, 4 ,,	79·2	77·7	8·0	0·5		79·0	73·5	28·0			100·3	110	24
,, 5 ,,	79·0	77·5	8·0	0		78·5	73·5	25·0			99·6	116	22
,, 6 ,,	79·6	77·9	9·2	0		79·0	73·5	28·0			100·3	110	24
,, 7 ,,	81·1	79·5	9·6	1·5		81·0	75·0	32·0			100·0	112	31
,, 8 ,,	82·7	79·6	18·6	0·5		82·0	76·0	33·0			99·2	88	14
,, 9 ,,	85·0	79.5	33·5	2.5		85·0	77·0	45·0			100·4	120	24
,, 10 ,,	86·6	79·6	43·2	2.5		86·5	79·5	42·0			99·2	92	16
,, 11 ,,	88·0	78·1	58·5	4·0		88·0	80·0	49·0			100·0	108	16
,, 12 o'c. noon	88·8	79·0	59·6	4·0		88·0	80·0	49·0			100·0	108	16
,, 1 o'c. p.m.	88·9	80·0	55·3	4·0		88·0	80·0	49·0			100·0	108	16
,, 2 ,,	90·1	79·0	65·8	4·0	D	90·0	75·0	82·0			99·8	94	24
,, 3 ,,	89·5	78·8	57·3	6 0		89·0	79 0	60·0			100·0	108	24
,, 4 ,,	89·8	78·8	66·4	5·0		89·0	79·0	60·0			100·0	108	24
,, 5 ,,	87·1	79·7	45·1	2·0		87·0	79·0	48·0			100·4	108	24
,, 6 ,,	84·6	78·8	35·2	3·0		84·5	77·5	40·0			100·3	130	25
,, 7 ,,	82·7	77·5	29·7	5·0		82·0	76·0	33·0			99·2	88	14
,, 8 ,,	81·6	77·5	23·6	2·0		81·5	75·5	32·5			100·2	112	31
,, 9 ,,	80·9	78·2	15·3	0·0		80·0	75·0	27·0			99·2	92	28
,, 10 ,,	80·4	78·1	13·4	0·5		80·0	75·0	27·0			99·2	92	28
,, 11 ,,	80·2	78·0	13·0	0·0		80·0	75·0	27·0			99·2	92	28
,, 12 o'c. midnight	80·1	78·1	11·9	0·0		80·0	75·0	27·0			99·2	92	28
September 23, 1 o'c. a.m.	79·6	77·6	11·0	0 0	E	79·5	74·5	26·5			100·2	90	24
,, 2 ,,	79·4	77·5	10·4	0·0		79·0	73·5	28·0			100·3	110	24
,, 3 ,,	79·1	77·3	10·4	1·0		79·0	73·5	28·0			100·3	110	24
,, 4 ,,	79·4	77·5	10·4	1·0		79·0	73·5	28·0			100·3	110	24
,, 5 ,,	79·3	77·5	9·8	0·5		79·0	73·5	28·0			100·3	110	24
,, 6 ,,	79·2	77·5	9·2	1·5		79·0	73·5	28·0			100·3	110	24

No movement of air perceptible.

Conditions which cause fever, A, C, E,
,, ,, do not cause fever, B, D,

I think that in fixing the degree of atmospheric wet bulb temperature at which body temperature begins to rise above normal, at 75° F. (23·7° C.), Sir T. Legge fixes it too high, for there are many of the observations from which he forms the opinion in which the body temperature was raised above normal by exposure to a much lower wet bulb temperature, and at least one observation in which the body temperature in the mouth rose to 100° F. (37·8° C.) under an atmospheric wet bulb temperature of 65° F. (18·3° C.) in less than one hour.

But accepting 75° F. (23·7° C.) as the degree of atmospheric wet bulb temperature at which body temperature begins to rise above normal, it is seen that the *September* atmosphere at Calcutta, details of which have previously been given, is such as must cause pyrexia, as its wet bulb temperature was above 75° F. (23·7° C.) *for the whole period of forty-eight hours*, and even reached a maximum

of 81·6° F. (27·7° C.), but the March atmosphere at Calcutta is not such as would raise body temperature above normal, for its wet bulb temperature never rose above 73° F. (22·7° C.) during the whole period of forty-eight hours, and even fell as low as 62·5° F. (18° C.).

But in thus concluding that the September atmosphere at Calcutta must raise the body temperature of many immersed therein we are leaving out of consideration the rate of movement of the air which regulates the rate of loss of heat from the body by conduction and convection, and which must therefore modify the effect of the high wet bulb temperature in raising body temperature.

In the details of the September atmosphere at Calcutta it is seen that the velocity of the wind, from 8 o'clock a.m. *throughout the day* until 9 o'clock p.m., varied from 2 to 8 miles per hour; whilst from 9 o'clock p.m. *throughout the night* until 8 o'clock a.m., the velocity of the wind never exceeded 1·5 miles per hour and fell to 0·5 and even 0·0 (dead calm) at several hours.

Thus the smaller movement, and at times even absence of all movement, of the air *throughout the night* must, by reducing loss of heat from the body by conduction and convection, increase the effect of the high wet bulb temperature in raising body temperature above normal; whilst the greater movement of the air *throughout the day* must, by increasing loss of heat from the body by conduction and convection, minimize the effect of the high wet bulb temperature in raising body temperature.

I thus arrive at the conclusion that any fever caused by the September atmosphere at Calcutta comes on and increases gradually throughout the night until about sunrise, and then, as a rule, declines gradually throughout the day, as the dampness of the air diminishes and the velocity of the wind increases.

The recurrence of atmospheric conditions which so raise body temperature on consecutive nights, as they did recur on the nights of the 21st to 22nd and 22nd to 23rd September at Calcutta, must make any fever so caused of a quotidian intermittent character, whilst if they recur only every second or every third night the fever must be respectively intermittent tertian or quartan.

Up to the present I have only considered the effect of the atmospheric conditions at Calcutta in September from the point of view of the impediment which they present to loss of heat from the body, and from this alone conclude they must raise body temperature above normal. But it is not only by impeding loss of heat from the body that the atmospheric conditions of the September nights at Calcutta raise body temperature. For the high atmospheric temperature, 79° F. (26·1° C.) to 83° F. (28·3° C.), impedes excretion of water through the kidneys, and the low atmospheric drying power, 8 to 27 gr. per ten cubic feet, impedes evaporation of water from the skin and lungs. They therefore produce an accumulation or *increase of water in the blood*, for physiologists tell us that the sweat glands are not stimulated to increased action, *i.e.*, sweating in resting conditions, until the temperature of the air reaches 91·4° F. (33° C.). The increase of water in the blood so produced is, of course, aggravated by the increased amount of water taken into the body as drink under such atmospheric conditions. But increase of water in the blood increases destructive metabolism or heat production in the body. The injection of 6 c.c. pure distilled water into the blood produces a transient rise of body temperature to 100° F. (37·8° C.).

Such increase of water in the blood, and consequent increase of heat production in the body, caused by the September night atmosphere at Calcutta subsides *slowly* during the following day as the drying power of the air, and consequently evaporation of water from the skin and lungs, increases. On September 21 at Calcutta the drying power of the air so increased from 34 gr. per ten cubic feet at 9 o'clock a.m. to 64·4 gr. at 1 o'clock p.m. And on September 22 at Calcutta the drying power of the air so increased from 33·5 gr. per ten cubic feet at 9 o'clock a.m. to 66·4 gr. at 4 o'clock p.m.

If during the day the temperature of the air reaches 91·4° F. (33° C.) the accumulation of water produced in the blood by the night atmosphere, would be *rapidly* reduced by sweating, and with it would also be reduced the increased metabolism or heat production caused by it; or if sweating is induced by drugs or by covering the body with blankets, the same effect would be *rapidly* produced.

Hence it appears that the night atmospheric conditions at Calcutta in September raise the body temperature of many above normal, cause pyrexia, by increasing heat production in the body as well as by impeding heat loss from the body.

Now, if it be asked, of what tissue in the body an increase of water in the blood produces increased destructive metabolism the first tissue mentioned must undoubtedly be the red corpuscles of the blood. For increase of water in the blood increases hæmolysis, that is, increases the destruction of red corpuscles, the liberation of their hæmoglobin into the liquor sanguinis, the production of pigment in the blood, and gives rise to the appearance in the blood of those bodies which, from their resemblance to Laveran's bodies, have been called pseudo-parasites.

Such increased hæmolysis demands an increased functional activity of the spleen, for the chief function of this organ is the disposal of the products or fragments of such hæmolysis. But with increased functional activity of the organ there must be enlargement, at first like the increased hæmolysis, of an intermittent character, but subsequently from repeated recurrence becoming permanent.

Is there then at Calcutta in September, and at other places having a similar or nearly similar climate, an intermittent fever, an ague, which is obviously caused by the meteorological environment under which it arises? So it was believed, and, although, perhaps, in a rather vague and indefinite way, taught in the medical schools of the

world for centuries. But in the medical schools of to-day such a view of malaria, if mentioned at all, is only referred to as a curious ancient superstition!

In this paper I have adopted, as many physiologists do, the wet bulb temperature of the air as an indication of the effect on body temperature of atmospheric conditions, but I prefer taking separately, as I have done in previous papers on this subject, the dry bulb temperature, the drying power, and the rate of movement of the air for such purpose, for by these are regulated the rate at which heat is being lost from the body by radiation, by evaporation, and by conduction and convection. The advantage of regarding malaria from this meteorological point of view is that by so doing we avoid the necessity of presuming the existence of a toxin, which has never been isolated, in order to explain the intermittent pyrexia, hæmolysis, and enlargement of the spleen which are so characteristic of the disease.

A CASE OF ACUTE AGCHYLOSTOMIASIS TREATED BY AN AUTOGENOUS VACCINE OF A COLIFORM ORGANISM.

By Captain R. G. Archibald, M.B., R.A.M.C.
Pathologist and Assistant Bacteriologist, Wellcome Tropical Research Laboratories, Khartoum.

The patient was an Arab admitted to the Khartoum Prison Hospital suffering from fever and marked anæmia.

Previous History.—Up till six months ago he had always enjoyed good health, but since then he had been subject to febrile attacks. For about a month previous to admission he had apparently suffered from continuous fever and increasing weakness and had acquired the habit of geophagy.

Condition on Admission.—The patient was extremely thin, weak and anæmic, and complained of headache, anorexia, vertigo and constipation. The tongue was furred, and his general appearance resembled that of a serious toxæmia. The pyrexia was of a remittent type, showing an evening rise of 2° or 3° and a morning fall.

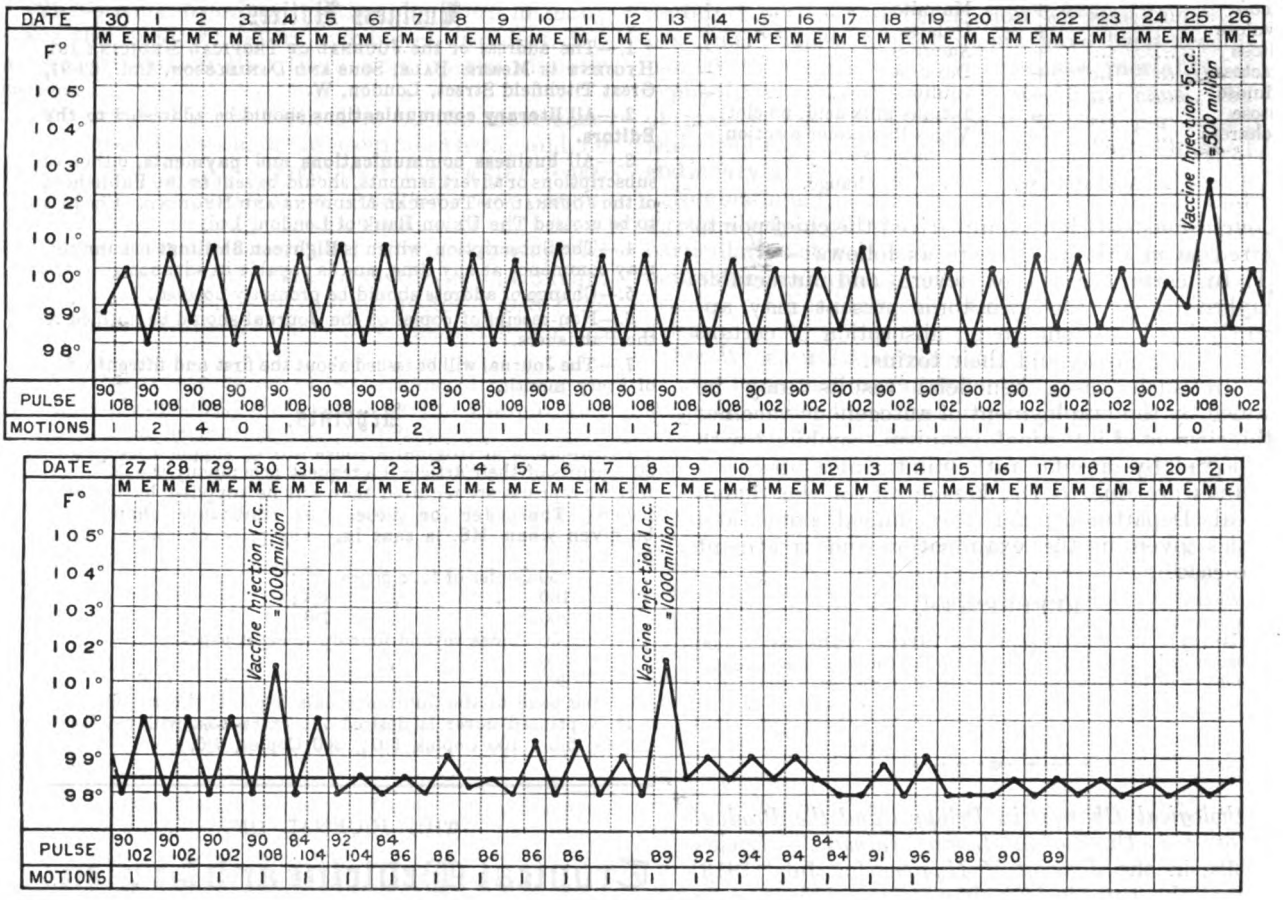
There was no evidence of tuberculosis. The spleen was very much enlarged, firm in consistence, and extended to a point about an inch above the umbilicus. The liver also showed some enlargement below the costal margin.

Several peripheral blood films were examined, but with negative results as regards the presence of malarial or other parasites. There was a very definite eosinophilia present. The red cells showed a marked poikilocytosis, and both microcytes and megalocytes were noted. Myelocytes and erythroblasts were not found. The eosinophilia suggested the possibility of an intestinal parasitic condition. A purge was therefore administered to the patient, and a sample of the fæces obtained for examination. The fæces were very offensive and alcoholic, and contained large numbers of adult agchylostome worms and their ova. Eucalyptus oil combined with chloroform was administered in large doses, but with little or no benefit, for the patient became progressively weak, and to all appearances a fatal issue seemed imminent. Having previously obtained encouraging results by the use of an autogenous coliform vaccine in a case of acute intestinal schistosomiasis, the writer suggested that this line of treatment might be employed.

Another specimen of the fæces was obtained and suitably plated out. Almost a pure culture of a coliform organism was obtained, and its cultural characters worked out (see p. 262). A vaccine of the organism was prepared. The patient received an injection of 500 million organisms, followed five days later by an injection of 1,000 million, and this amount was subsequently repeated at the end of a week. The result obtained was striking. There was an immediate improvement following the first injection of the vaccine. The tongue became clean, and all the toxæmic signs disappeared. After the third injection the patient's temperature remained consistently lower, but, as will be seen from the charts, each injection of the vaccine was followed by a temporary rise in the patient's temperature. The spleen and liver diminished in size and the patient commenced to put on weight rapidly, and was shortly afterwards discharged from hospital.

Remarks.—Certain points in the above recorded case appear to be worthy of comment. The patient represented one of those serious toxic types of cases that apparently would have ended fatally but for the timely employment of vaccine therapy. In admitting this the writer does so without reserve, for although cognizant of the fact that certain cases of intestinal parasitic infection frequently show an amelioration of their symptoms, it would be difficult in this instance to attribute the striking and immediate improvement in the patient's condition to anything but the use of the vaccine. To all appearances the serious state of the patient was in a chief measure due to the absorption not so much of the toxins of the causal helminth, but to the toxic products of intestinal organisms, and it was based on this hypothesis that vaccine therapy was suggested and employed. The effect of the vaccine treatment on the enlarged liver and spleen certainly appeared to support this hypothesis, for no enlargement of either of these organs could be detected by the time the patient left the hospital.

During the last few months the writer has had opportunities of studying clinical cases of intestinal schistosomiasis, and from observations made has come to the conclusion that the clinical picture of some of the acute toxic types of these cases is dependent on an absorption of toxins of certain intestinal bacteria. These toxins, apparently owing to the reduced state of health of the patient, give rise to grave symptoms. In two such cases vaccine therapy was employed, and with most encouraging results. Our present knowledge of the part played by the *Agchylostoma duodenale* in producing certain symptoms seen in agchylostomiasis is far from satisfactory, and, in the writer's opinion, the



causal helminth is possibly credited with more than its due share. One knows that in a certain class of these cases the signs and symptomatology are out of all proportion to the number of worms found in the host, a fact suggestive of the presence of an additional toxic agent in the intestinal tract. What is the nature and source of this toxic substance remains yet to be proved. Little is known of the chemistry of the toxins of intestinal bacteria; indeed, the subject has not received the attention it deserved, considering the important part played by the alimentary tract in health and disease, and in the writer's opinion some far-reaching results might be obtained in the treatment of some cases of agchylostomiasis and intestinal schistosomiasis were evidence forthcoming regarding the significance of certain intestinal organisms found in patients affected with these diseases. Castellani [1], in his researches, noted the presence of different types of fever in agchylostomiasis, a clinical fact difficult of explanation if the worm is to be considered the sole agent for the pyrexia. Further, in some cases the pyrexia continues long after the patient has got rid of the agchylostome under adequate treatment. Padoa [2] and others found that the processes of intestinal putrefaction were very marked in this disease, in which case it is more than likely that the resultant toxins must necessarily affect the health of the patient.

There appears, therefore, a certain amount of ground for the supposition that other factors, probably intestinal bacteria, are partly responsible for the clinical picture sometimes observed in agchylostomiasis and intestinal schistosomiasis, and it is for such cases that the writer puts in a plea for the trial of vaccine therapy as a means of tiding the patient over a toxæmia. If this treatment be followed by, or combined with, the specific anthelmintic remedies some good might be done for a class of case that usually terminates fatally. The toxic properties of many of these anthelmintic drugs are well known, and if exhibited to such a case as described in this paper may have anything but a beneficial effect; if, however, the patient's general condition can be improved and the " toxæmic tide " lessened by previous vaccine treatment his chances of reacting to anthelmintic measures are increased.

The writer recently examined the case forming the subject of this paper and found him in apparently good health and carrying out manual labour. A specimen of his fæces was obtained and agchylostome ova were still found to be present.

The organism isolated from the patient's fæces and from which a vaccine was prepared possessed the following characters: It was a sluggish, motile, Gram-negative, non-spore-forming indole-producing bacillus which gave the following cultural reactions:—

Glucose	... ...	+	Mannite	... ...	+
Lævulose	... ...	+	Dulcite	... ...	+
Maltose	... ...	+	Adonite	... ...	−
Galactose	... ...	+	Dextrine	... ...	−
Raffinose	... ...	−	Inulin ...	... ...	−
Lactose	... ...	+	Litmus milk acid, no clot		
Saccharose	... ...	—	Voges-Proskamer reaction negative		

\+ = Acid and gas. − = No change.

Conclusions.—Briefly summarized the chief points referred to in this paper were as follows:—

(1) In certain cases of severe and intractable agchylostomiasis, the symptoms present may apparently be dependent on an absorption of certain intestinal organisms and their toxins.

(2) In such cases beneficial results may be obtained by the employment of autogenous vaccines of the suspected intestinal organism, combined with or followed by specific anthelmintic measures.

Thanks are due to Dr. Mashowef, of the Sudan Medical Department, for the clinical notes and facilities given in the examination and treatment of the case.

REFERENCES.

1. CASTELLANI, A. (December, 1912). "Discussion on Ankylostomiasis in British Guiana and Methods of Treatment." *Transactions of the Society of Tropical Medicine and Hygiene.*

2. PADOA (1909). "Rivista critica di clinica Medica."

Pathological Changes in Pellagra and the Production of the Disease in Lower Animals.—Lucius Nicholls, in the *Journal of Hygiene* for July, 1913, describes the pathological changes found in man in pellagra. He bases his description on eight *post-mortems* and microscopical sections of specimens taken from these subjects.

The pathological changes which take place in pellagra, he says, are to a great extent due to degeneration of the capillaries and smaller vessels; this gives rise to stenosis and blood stasis which cause leakage or actual hæmorrhages from the weakened vessels. This explains the atrophy of the tissues by impaired nutrition, and the eruption on the exposed skin surfaces where solar radiations and possibly other factors accentuate the damage which has taken place in the vascular supply with consequent exfoliation of the stratum corneum, bleb formation from exuding serum, and pigmentation from altered hæmoglobin. The tissue cells, especially those of the liver, spleen, and alimentary tract, are also attacked.

The author believes he has produced a condition similar to pellagra in rats by feeding them upon decomposed corn meal. He describes the symptoms in the rats and also the *post-mortem* appearances. It is doubtful, of course, if the condition can be looked upon as the same as human pellagra.

ELEPHANT grass has been sent to the Imperial Institute, London, from Uganda, in order to test the possibility of utilizing the grass for the purpose of paper making.

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SEPTEMBER 1, 1913.

BRITISH MEDICAL ASSOCIATION.

DISCUSSION ON THE CAUSES OF INVALIDING IN THE TROPICS.

(*Continued from p.* 250.)

DR. C. F. HARFORD (Livingstone College) pointed out that there was a special difference between the military and missionary statistics, the latter including women as well as men. Both classes, however, may be regarded as selected lives.

(1) *Bowel Disorders.*—These he regarded as directly or indirectly the most important cause of invaliding, and, apart from severe nerve troubles, the most serious.

Enteric Fever undoubtedly has been the most serious cause, but with the employment of anti-typhoid inoculation it is lessened.

Sprue is again a common and serious cause of invaliding.

Colitis has proved to be very persistent, and often difficult to deal with.

Intestinal parasites are probably more commonly associated with intestinal disorders than is generally recognized.

Bowel disorders seem to be most prevalent in China and India.

(2) *Nervous disorders*, he thought, were in many cases the result of fevers and bowel disorders, but he was of opinion that there were special climatic causes.

(3) *Fevers*.—These seemed to be the most common cause of invaliding in Central Africa, and he would place first in importance *blackwater fever*, and second, especially in Uganda, *tick fever*. *Malta fever* also had to be reckoned with.

(4) *Women's Diseases*.—He had noted a special prevalence of *fibroid tumours* in China and Japan. Troubles connected with the climacteric also have to be remembered especially neurasthenic in character.

(5) *Arthritic troubles* of a serious character he had noted, especially in cases from the Punjab, but he did not desire to lay stress on this.

(6) *Tubercular cases*, he thought, were chiefly due to infection.

Dr. Harford stated, in reply to Sir William Leishman's question as to the return to the Tropics of those who have suffered from blackwater fever, that he thought each case should be treated on its merits.

He did not believe in any arbitrary rules. Professor Koch advised that if a man had blackwater fever he should as soon as possible after start taking small doses of quinine until he got back to the regular prophylactic dose, and that if he continued this he might continue to reside in the country where he had contracted the disease. This he believed to be good advice. If the individual had an exceptionally severe attack with cerebral symptoms or any tendency to suppression of urine, then he should not return. If, however, the attacks were not exceptionally dangerous, and the patient could and would take quinine prophylactically, then he might return.

Dr. Duncan White (China) said that for the purpose of guarding the lives of Europeans in South China—where tuberculosis is so rife amongst the natives—it is desirable that the household servants should be carefully examined. One's bed should *not* be made and one's food should *not* be prepared by servants who are expectorating tubercle bacilli.

Major W. S. Harrison, R.A.M.C., said: During recent years there has been a very great reduction in the total numbers sent home from the Army in India on account of tropical disease. Part of this reduction is due to a general improvement in the health of the Army, part of it to more effective treatment, and a part to the more extended use of hill stations. With regard to enteric fever, we formerly sent home from 3·6 per cent. to 6 per cent. of those admitted, and 0·4 per cent. were finally discharged. We now send home 1·7 per cent. of the patients, and 1·3 per cent. are finally discharged. For dysentery we used to send home 4 to 5 per cent. of those admitted; now we send 1·5 per cent., and at the same time we have reduced the numbers of those finally discharged from about ½ per cent. of admissions to less than a tenth per cent. Malarial cases used to be sent home at a rate of approximately 1 per cent. of cases; now we send home 0·1 per cent. These improvements have been accompanied by a reduction in the case mortality of typhoid fever from 22 per cent. to 13 per cent., and of malaria from 0·2 per cent. to 0·09 per cent., while the case mortality of dysentery has remained stationary at about 3 per cent.

Neurasthenic conditions and the sequelæ of heat stroke always call for a return home. I have been particularly struck with the high proportion of neurasthenics among officers, either primary in origin or following such things as chronic bowel disease.

Sir William Leishman, the President, said that it was important to consider the advice to give to those invalided from the Tropics in respect of their return thereto. In his opinion tropical physicians had fewer graver decisions to make than in many of these cases, where a man's whole career might depend on whether he was advised that he should never return to the country from which he had been invalided. In some cases he thought such advice was hardly justifiable on our present knowledge, and he was familiar, as many others must be, with instances in which the advice, by stress of circumstances, had been disregarded, and the individual had nevertheless returned to his station and enjoyed good health for many years. On the points raised by Dr. Price in connection with the prophylactic use of anti-typhoid vaccine, he might answer in the light of his experience with this vaccine in the Army. The advantages of employing a local strain of *B. typhosus* for the preparation of a vaccine appeared to him purely theoretical, and he had no evidence in support of this proving a useful modification. Reinoculation, in his opinion, should be carried out after a lapse of two and not of three years.

Dr. Malcolm Watson (Malay States) considered that women suffer more than men from life in the Tropics apart from any disease. Neurasthenia is the chief trouble, and a yearly change for a month to a hill station frequently prevented the condition. Neurasthenia in men is frequently associated with loss of weight; the stout, well-fed man is seldom neurasthenic. The return of invalids to the Tropics should depend largely upon the disease and upon the region to be lived in. A man who has had blackwater fever should avoid if possible a highly malarial district. Dr. Watson believed in the preventive value of small doses of quinine.

Dr. Cameron Blair (Nigeria) thought that the fact that officers suffer more than private soldiers from neurasthenia is due to the more solitary life the officer leads, especially in out-of-the-way districts, where there may be but one or two officers in charge of a company. Cardiac dilatation he considered to be due to the hard work entailed, sitting up during half the night it may be, writing out reports after the strenuous work of the day. An attack of malarial fever demands a three months' course of quinine. After recovery from blackwater fever, provided the heart is sound and the urine

free of any trace of disease, a man may safely return to the Tropics.

SPRUE.

Mr. JAMES CANTLIE (London) brought forward several points concerning sprue which he said he was surprised to find did not seem to be generally recognized.

(1) Temperature in sprue: A continued fever coming on in chronic sprue cases generally marked the last stage of the disease. As a rule, the patient lives from five to eight weeks after persistent high temperature of 100° to 102° F. In one case recently, however, the febrile state had lasted four months before the fatal issue. He had never seen a case of sprue recover in which this condition obtained. It would appear as if a toxin had developed which the tissues were incapable of keeping in check.

(2) Neuralgia of the anus is a late development in sprue, but a very troublesome condition, and met with only in cases which are near—a few weeks from—the end. Often in sprue there is an itching of the anus, with some dryness and discomfort, but this is quite different from the acute suffering which Mr. Cantlie styled neuralgia. At times this is accompanied by excoriation, crack or ulcer at the anus, but more often there is no lesion to be seen or felt.

(3) A general tetany is recorded by Mr. Cantlie in six cases of sprue observed by him within the past eighteen months. It is a condition which he has not noted previously, and at first he was inclined to think the tetanic spasms were due to the medicinal treatment in use. This, however, was proved not to be the case. The tetany is characterized by acutely painful spasm of the muscles, not only of the extremities, but in the neck, face, chest and abdomen. The fingers are pressed firmly against the thumb or doubled up in the palm, and it is impossible for either patient or doctor to separate them. The temperature may rise to 103° F. or more, or it may be only a fraction above the normal. The attack, when severe, may last one to two or three days, gradually subsiding. Mr. Cantlie stated that the condition comes only in very anæmic persons and those who had suffered from sprue for years.

Treatment.

As regards treatment, Mr. Cantlie says he has lately used *Collosol argentum* (Crookes); a solution containing the metal silver in a colloid state. This is a preparation by Professor Crookes of silver in which the actual particles are of extreme minuteness and exhibit, under ultra-microscopic conditions only, marked "Brownian" movement. Bacteriological tests show that the *B. coli communis* is killed in ten seconds, and no microbe is known that is not killed in laboratory experiments in six minutes. Castellani's recent findings in sprue suggest the use of a bactericide and an antiseptic, and Mr. Cantlie has used the preparation with some degree of success. Being non-toxic, the dose can be increased from 1 to 2 or more drachms twice or thrice daily. In several cases of sprue Mr. Cantlie finds that in from 76 to 118 hours stools lose their frothiness and their bulk, and a fairly solid motion can be anticipated showing the presence of bile. This he has found even in the last stages of sprue when the temperature was over 101° F., and anticipated death actually occurred.

As regards diet, Mr. Cantlie adheres to the meat treatment of sprue, and when recurrences occur and persist he advocates for three days nothing but milk, three days nothing except meat, and three days a strict farinaceous diet; but no mixture of these on any account. Strawberries continue to hold their position as a curative agent. When the short strawberry season is over, ripe gooseberries (not in pies) in quantity, or raspberries or melons do almost if not quite as well. As a medicine, powdered cuttlefish bone and native carbonate of soda is a remedy which has stood the test of some thirty years, and retains its position.

Major W. S. HARRISON said he had seen one case of sprue with marked tetany. With regard to the sore mouth, he had noticed that when a patient gets an intercurrent attack of acute diarrhœa the mouth symptoms improve when the stools get more into the chracteristic sprue condition, and especially when they become solid the mouth symptoms recur.

Thursday, July 24, 1913.

DISCUSSION ON DYSENTERY.

CAPTAIN S. R. DOUGLAS, I.M.S., introduced the subject by a paper entitled "The Life History of the Amœba causing Dysentery." He reviewed the work of Schaudinn in establishing the *Entamœba histolytica*, and of Viereck's finding of the *E. tetragena*. Schaudinn's researches concerning the life-cycle of *E. histolytica* are now doubted as regards the exogenous cycle, and Viereck's is considered the true life history. Darling's experiments with kittens by feeding them on mucus from dysenteric stools containing cysts of *E. tetragena* constantly produced signs and symptoms of dysentery in these animals; if no cysts were present no infection resulted.

Virulent entamœbæ have never been grown on artificial media. Amœbic dysentery is usually considered a tropical ailment, but several cases of the kind have been recorded from France, Germany, and Britain.

Complications less commonly met with are: Abscess of the brain in which the amœbæ have been found; phagedænic ulceration of the skin in which amœbæ are present.

Treatment.—Emetine, introduced by Vedder and used extensively by Rogers, has proved successful when administered subcutaneously; the symptoms of dysentery rapidly disappear, hepatitis resolves, and when an abscess of the liver supervenes injection of emetine, combined with simple aspiration, has proved successful.

It would seem that the use of emetine in dysentery is not new to therapeutics, for in 1817

Magendie and Pellitier recommended its use, and L. Bardsley, in 1829, obtained good results in dysentery and chronic diarrhœa. That this very effectual remedy passed from the ken of medicine was most probably due to the fact that the differences between amœbic and bacillary dysentery were not diagnosed; but with Vedder's scientific experiments proving that emetine kills the amœbæ, and Rogers's practical application of the knowledge thus gained we are in a position to regard amœbic dysentery and its complications with much less dread than heretofore.

F. Graham Willmore and A. Harold Savage (Egypt) contributed a paper entitled "The Diagnosis and Treatment of Epidemic Bacillary Dysentery." After alluding to the prevalence of dysentery amongst Mecca pilgrims, to the frequency of epidemics in even temperate zones, to the prevalence of dysentery in war, and to the persistent and fatal nature of epidemics of dysentery, the authors proceeded to give the results of treatment of 227 cases of bacillary dysentery. Accepting the present division of dysentery into amœbic, bacillary, and mixed forms, the authors discussed the diagnosis of bacillary dysentery by the isolation of the specific germ or germs from the stools and by the agglutination reactions of the patient's serum against them and against stock cultures.

It seems sufficient to prove by one or other of these tests singly the nature of the malady, *i.e.*, to say that a bacillary dysentery is present. A positive diagnosis is most readily arrived at by one of the serological tests, especially the agglutination reaction of patient's serum, and it has been the authors' practice recently to test the serum of every patient against four types of bacilli in dilutions of 1:20, 1:40. With the lower type the agglutination is usually multiple, and an attempt to overcome this proved unsuccessful. If, then, a bacillus is isolated from the stools, or if a positive agglutination reaction is obtained for one or more bacilli, the authors consider bacillary infection is present.

The number of dysenteric patients who succumbed to nephritis caused some anxiety as to whether the massive doses of serum were the cause of this fatality; but this was refuted on further investigation and was proved to be due to the rapid elimination of the serum administered.

The clinical routine was as follows:—

Immediately on entering the hospital the patient was given a dose of castor and almond oils, and a few cubic centimetres of blood were taken aseptically from the median basilic vein. The stools were examined microscopically and plated out. If amœbæ were found to be present, emetine was at once given. (This last remark applies only to 1912-13.) According to the data furnished by the blood reactions and the stool plates, appropriate serum was administered. In 1911 multivalent and different monovalent serums were used; in 1912-13 multivalent serum only was employed, with the exception of a few doses of monovalent Shiga serum in cases where *B. shiga* was isolated from the stools. In urgent cases, stimulants were given and treatment with multivalent serum and emetine was initiated immediately after the blood was taken without waiting for the results of the laboratory examination. With regard to the quantity of serum to be injected, later experience tends to confirm the opinion that the best results are obtained from the administration of very large doses—from 80 to 120 c.c.—injected either deeply into the subcutaneous tissues of the flank and abdomen or intravenously; this procedure is entirely without danger. Moreover, anaphylaxis is less likely to occur after a massive initial, followed by decreasing repeat doses, than it is after a small initial dose. Secondly, the cases treated arrived at the hospital saturated with dysentery toxins, which had to be neutralized before the beneficial effect of rest and appropriate diet could be brought into play. In 1913 a comparatively small quantity of the multivalent serum was used, supplied by the Lister Institute, which is recommended to be given in doses of 20 c.c. Without entering into any discussion as to the relative potency of the Lister serum and the authors', trials of this serum in the dose recommended by the Lister Institute, and the dose which he habitually employed himself, the results led to absolutely parallel conclusions and furnished no less striking a plea in favour of the massive dose. These doses are repeated twice daily or at longer intervals, as the patient's condition demands, during not longer than ten days after the first dose. It was often noted that the patient exhibited marked improvement for a few hours following the injection, only to relapse when the effect had presumably worn off. Such cases should be injected repeatedly until the improvement becomes permanent.

In such a case, it may be noticed, that whereas at first injections may be necessary every few hours, later injections may be only required at intervals of some days. Another advantage, which in our opinion accrues to this method, is that among patients who have thus been thoroughly saturated with the serum relapses *when convalescence has once definitely set in* are practically unknown; at least, we cannot call to mind any such failure. This point is of considerable importance as regards carriers. Dr. Warnock, the Director of the Government Hospital for the Insane at Abbassia, in a private letter to one of us (F. G. W.), states that in asylum epidemics in England practically all "cured" cases later relapse and become carriers. This seems to be his experience also at Abbassia, where cases of dysentery are continually occurring and are treated with, at the most, one or two injections of 30 c.c. of multivalent serum. In mild and especially early acute cases, 40 to 60 c.c. were sufficient, unfortunately such cases at Tor are very rare. The first and most appreciable result of an injection is an improvement in the patient's general constitutional condition, which becomes apparent in a few hours. One or two cases improved so rapidly that, from being apparently moribund on admission, they were able within a few hours to enjoy with impunity a meal, the bounds to which were set by the dictates of prudence rather

than by the appetite of the patient. The improvement in the character of the stools takes place much later, and in the chronic and gangrenous cases may not be apparent for many days. The physician should not be discouraged in this event, and especially should not discontinue the treatment with the idea that it is doing no good. It should be remembered, as numerous autopsies in pre-serum days at Tor only too clearly showed, that in these cases the entire mucosa of the large gut and often some 3 ft. of the lower end of the ileum may be the seat of a coagulation necrosis, which has destroyed the superficial layers and replaced them with a bright green or blackish green diphtheritic false membrane. This dead tissue must be got rid of; as in diphtheria the injection of serum is followed by an improvement in the patient's condition and expulsion of the membrane by coughing, so in bacillary dysentery the passage of sloughs is not incompatible with a critical amelioration of the disease.

Death, when it occurs, is due to poisoning by the absorption of toxins secreted by the bacillus, and never to the local effects of the latter. In contrast to the destruction of tissue seen in amœbic dysentery, in the bacillary variety ulceration is always comparatively superficial, and never gives rise to perforation and peritonitis, or to liver abscess.

For the above reasons the strict limitation of diet necessary in amœbic dysentery is inadvisable, while particular attention should be paid to the heart, lungs, and kidneys.

Prophylaxis consists in free administrations of serum and stimulants, discouraging a dorsal decubitus and the most scrupulous attention to securing an aseptic condition of the mouth. Once broncho-pneumonia is well established, no treatment seems to have the least effect in averting a fatal issue—it is mere waste to inject serum.

It occasionally happens, after the patients have recovered under serum treatment from all immediate danger, that convalescence is retarded by an intermittent diarrhœa—with or without mucus and muco-pus—which serum appears to be unable completely and permanently to control.

If such a case come to autopsy, be it for dysentery or intercurrent disease, the large intestine is often found entirely denuded of its mucosa and of a bright red colour, showing where the false membrane above mentioned has sloughed away, leaving what is practically a large granulating wound, on which are small patches showing all stages of the morbid process. The condition is very similar to that seen in large superficial burns of the skin. It is obvious that this surface not only is functionless, but is in any case extremely irritable and an excellent door for the entrance of secondary infecting bacteria. No one in his senses would expect a granulating wound of the skin of such superficies to heal up in a few days, even though it be kept comparatively aseptic. How then can a similar wound in the intestine, continually bathed in septic material, be expected to heal more rapidly?

Treatment in these cases must aim, obviously, at supporting the patient's strength, securing as aseptic a condition as possible of the intestinal contents and giving the inflamed bowel as much rest as possible. As regards treatment by medical means, it may be laid down as an axiom that the fewer drugs that are given the better. It is conceivable that this class of case would offer a fair field for vaccine therapy; and in fact we tried it in 1910 with apparent success; our experience was limited, however, to one or two very obstinate cases, convalescing from gangrenous bacillary dysentery (*B. tor* isolated), one of whom ultimately recovered completely—we did not give it a more extended trial as our multivalent serum was on probation and we did not wish to obscure the main issue by introducing elements of polytherapy. Reliance, at present, must be placed, therefore, essentially on an appropriate dietary, which should be appetizing and combine a maximum of concentrated, easily digested nourishment with a minimum of residue; milk fulfils none of these desiderata—it is bulky, most patients loathe it after a certain time, it leaves a hard massive residue of undigested casein. Citrated milk is, in our experience, little better, whilst most of our patients flatly refused to take it. Yaghûrt,* on the other hand, was always taken with the greatest avidity, being in one form or another the staple diet of many Oriental peoples; while examination of the stools showed it not to be completely digested, it had an undoubted effect in arresting the putrefaction of the intestinal contents, and never gave rise to the meteorism and colics which were so often seen in the days of the plain milk diet. The Yaghûrt may be supplemented in severe cases with albumen water, expressed raw meat juice and lean raw meat pulp, given in warm —not hot—soup or beef tea. Later thick purées of potatoes, peas or lentils, well-strained gruel and porridge, lightly cooked chicken and fish—preferably made into a cream with potato purée—light omelettes, soft white cheese, &c., may be added to the dietary; sugar should be given freely and is conveniently administered in the form of malted milk (Horlick). Feeds should be given often and only a small quantity allowed at a time; nothing very hot or very cold should be allowed. Stimulants should be given freely when their use is absolutely indicated, but alcohol in any form is to be avoided as much as possible. As far as local treatment is concerned, lavage with any solution stronger than physiological saline or linseed tea is, in our opinion,

* [Yaghûrt must be prepared with the greatest care; it has been our practice to buy in Suez at the commencement of the pilgrimage season several samples of Leban Zibad and to inoculate them into sterilized milk—that which gave the softest and most homogeneous curd was then plated out on Maconkey or lactose cochineal agar and pure cultures obtained of a large lactic acid-producing bacillus and a long streptococcus (? *S. lebensis*). These were then inoculated into sterilized milk ("Natura" brand), (the Australian condensed milk is unsuitable), and each batch of Yaghûrt, prepared in covered sterilized jars in an incubator at 37° C., was inoculated with a flamed spoon from the preceding one. The curdled milk prepared from the various so-called lactic acid tablets on the market should, in our opinion, never be used.]

to be condemned. We particularly dislike the much-vaunted injections of silver nitrate. In any case, we use lavage, as a rule, only in cases of post-dysenteric constipation.

REFERENCES.

[1] HIRSCH: "Historical and Geographical Pathology."
[2] RUFFER and WILLMORE: *British Medical Journal*, November 12, 1910.
[3] CRENDIROPOULO: *Archives de Med. Experimentale*, Tome xxxiv, No. 6, November, 1912.
[4] NÈGRE et RAYNAUD: *Compt. rend. de la Soc. de Biologie*, Séance du 18 Mai, 1912.
[5] RUFFER and WILLMORE: *British Medical Journal*, September 25, 1909.
[6] S. GRYGLEWICZ: *Ann. de l'Inst. Pasteur*, xxvi.
[7] VAILLARD and DOPTÉR: *Ann. de l'Inst. Pasteur*, xxi.

Dr. C. M. WENYON, Protozoologist, London School of Tropical Medicine, read a paper on "Some Remarks on the Morphology of the Intestinal Amœbæ in Man." He said (1) that the clear separation of the various amœbæ or entamœbæ from one another is most difficult, and until some satisfactory method of cultivating them has been discovered the difficulty will remain. For just as it is possible by altering the quality of the water in which fresh-water amœbæ live to produce changes in the individual amœbæ, so the entamœbæ in the intestine will vary with the changes in the quality of the contents of the bowel, and it is the non-recognition of this fact that has led to the multiplication of so-called species of this protozoon. (2) An unwarranted assumption exists that entamœbæ should be uniform in appearance at every stage of its existence; this is disputed by Darling, who has shown that the pathogenic entamœbæ of man passes through a life-cycle in which entire multiplication alternates with a stage of encystment and the entamœbæ assume quite a different appearance as these stages develop. (3) Many of the entamœbæ escaping with the stools are in a condition of degeneration or actually dead, and the appearance of these has caused several observers to fall into error in the belief that they were dealing with separate species or varieties.

Two fairly well-defined types of entamœbæ are known. One is the pathogenic entamœba known variously as *E. histolytica*, *E. tetragena*, &c. In a definite type of this variety there is a clear ectoplasmic layer, enclosing the more liquid endoplasm, in which the comparatively small nucleus and food vacuoles lie. Red blood corpuscles are frequently seen to be enclosed. In stained specimens the ecto- and endoplasm and the nuclear structure can be seen; there is a definite nuclear membrane upon the inner surface of which chromatin granules are arranged. At the centre of the nucleus a central granule can usually be distinguished representing, according to Hartmann, a karyosome with centriole; the presence of the centriole at times is more or less of an assumption and is largely dependent upon the view that the centriole represents the centrosome, which must be present for the purposes of nuclear division. Although the above-described entamœbæ is that usually met with in amœbic dysentery, many of the entamœbæ present in a specimen will be found to have nuclei of different types, but in which one or other of the features of the typical nucleus is shown. Wide variations, however, do not justify their being considered different species, even although the cytoplasm is equally variable.

In non-pathogenic *E. coli* there is little tendency to separation into ectoplasm or endoplasm, as in the typical amœbæ of dysentery, but in some cases the *E. coli* met with in healthy intestines may simulate very closely the pathogenic form, and the question is whether we have a mixed infection.

After discussing the encysted forms and their variations, and that these forms are more readily recognized than the entamœbæ themselves, Dr. Wenyon ended where he began by saying the various problems these variations in amœbæ present cannot be settled by the mere examinations of stained preparations nor by inoculation experiments with possible mixed infections; and they probably will not be settled until some method has been devised by which pure cultures of these intestinal entamœbæ can be maintained for study and used for infecting animals.

Major W. S. HARRISON, R.A.M.C., said: By far the most frequent form of dysentery in the Army in peace time is amœbic dysentery. A number of patients with amœbic dysentery never have had an acute attack with the appearance of bloody mucus in the stools, but in all one gets some history of irregularity of the bowels with griping at times. The irregularity may consist in occasional attacks of diarrhœa with intervals of constipation, or the patient may never pass a solid stool; profuse watery stools are, however, unusual as a regular feature. One can usually find a tender spot somewhere along the colon, the most frequent places being the cæcum, the sigmoid, and the region of the two flexures, and in a thin subject it is often possible to determine that there is some thickening of the colon over these areas. If the history and symptoms point to amœbic dysentery it is not necessary or desirable to wait until amœbæ are found in the stool before making a diagnosis. My present routine is to examine the freshly passed stool for amœbæ, and also to make cultures from it. If the culture does not show the presence of one of the dysentery bacilli, and the history and symptoms are sufficient, I assume that amœbic infection is possibly present, and I commence giving emetine in doses of $\frac{1}{4}$ gr. to $\frac{1}{2}$ gr. daily. In addition I irrigate the bowel with saline followed by saline containing quinine.

In liver abscess emetine is of the greatest value; many cases which one could confidently say had gone on to pus formation subside under the influence of the drug. I usually keep up the use of emetine for ten days, then go on with ipecacuanha for two weeks, giving it in 20 gr. doses daily; the preliminary treatment with emetine seems to produce a tolerance for ipecacuanha, and one rarely then gets vomiting even when the drug is given as an uncoated bolus.

Lieut.-Colonel MOLESWORTH, I.M.S., said that in

Madras Hospital emetine had been given in doses from $\frac{1}{6}$ gr. to $\frac{1}{3}$ gr. up to nine injections during a week. Emetine given before an operation for liver abscess reduces the temperature, lessens the cachexia, and thereby improves the patient's chances of recovering from the operation.

Lieut.-Colonel A. LEAHY, I.M.S. (retired) drew attention to the good effects of a saturated solution of sulphate of magnesia in both acute and certain chronic dysenteries. Colonel Leahy insisted upon the direct connection between dysentery and liver abscess.

Sir WILLIAM LEISHMAN, F.R.S., said that the results which Drs. Willmore and Savage had shown of the results of a multivalent serum in the treatment of bacillary dysentery were very striking, and had done something to raise serum-therapy from the disfavour it had of late fallen into.

Major HOUGHTON, Major JACKSON, and Dr. MALCOLM WATSON also took part in the discussion.

Professor WASIELEWSKI then gave a lantern demonstration of his investigations on dysentery.

PHLEBOTOMUS FEVER AND DENGUE.

By Lieutenant-Colonel C. BIRT, R.A.M.C.

IN the year 1908 Doerr proved by experiment that the summer febricula which year by year attacked the Austrian troops stationed in Bosnia and Herzegovina was of specific origin.

Similar febrile ailments had been reported in the records of our Army and Navy in the Mediterranean stations for nearly 100 years. They were attributed to solar influences, climate, intemperance, disorders of the digestion, and so forth.

On combining the successful experimental results of Austrian, English, and Italian investigators, it is found that (1) the subcutaneous injection of blood or serum withdrawn during the first twenty-four hours of sandfly fever excited the disease nineteen times; (2) inoculation with the filtrate obtained by passing such diluted blood through a germ-proof filter induced the infection fourteen times; (3) and that feeding experiments with infected sandflies were successful on twenty-one occasions.

Phlebotomus major (Annandale), called *P. perniciosus* by Newstead, is the common sandfly of Malta. *P. minutus* is widely distributed in sandfly fever localities; specimens of this variety have been sent recently by Capt. Loughnan, R.A.M.C., from Aden, where for many years the infection has been prevalent among our troops; hence it is probable that both these flies transmit the disease in addition to *P. papatasii*.

The existence of the phlebotomus and of the infection has been reported recently in Portugal, South of France, Italy, Corsica, Sicily, Greece, Palestine, Egypt, Soudan, Aden, Persian Gulf, Ceylon, Mexico, German East Africa, and India. In the Army Medical Report of the year 1911 it is stated that there were 1,393 admissions on account of sandfly fever among the European troops stationed in India. Phlebotomi have been captured in many part of Europe, Africa, Asia, and in North, Central, and South America.

Sandfly fever occurs every summer year by year, but dengue breaks out in sudden epidemics at intervals of many years. In Malta there are annual summer epidemics of sandfly fever among our troops, but the last occasion on which they were attacked with dengue was in the year 1881. The rapid dissemination of the dengue infection throughout a community, and the presence of rashes in about 70 per cent. of the cases, distinguish a dengue from a sandfly fever epidemic. No eruptions have been observed in the Maltese, Italian, and Chitral phlebotomus fever.

The causation of dengue has been investigated by Graham, Carpenter and Sutton, and by Ashburn and Craig. Inoculation of healthy persons with the blood of dengue patients gave rise to dengue eight times. Inoculation with filtered infective blood induced the disease twice. Inoculation with the salivary glands of an infected culex originated the ailment once. Infection has been conveyed by infected culices eight times, and by an infected stegomyia once. Graham protected families from dengue by mosquito netting. E. H. Ross extinguished epidemics of dengue in Port Said by exterminating the mosquitoes. Stitt prevented the spread of infection from 200 dengue patients by enclosing them in mosquito-proof wire cages.

Blood withdrawn after the first day of sandfly fever is no longer infective, but the blood of dengue patients in the second to the fifth day of the fever excited the disease. Phlebotomi are unable to transmit sandfly fever until six days after feeding on a sandfly fever sufferer in the first day of his illness, but dengue has been conveyed by mosquitoes immediately after sucking infective blood; nevertheless the virus survives in them for twenty-seven days. An attack of sandfly fever does not confer immunity against dengue, and *vice versa*.

The stegomyia was regarded by Legendre as the transmitter of dengue in a widespread outbreak at Hanoi in 1910. Davidson noted that this mosquito was present everywhere in Brisbane during the dengue epidemic of 1911.

There is a close resemblance between the sandfly dengue and yellow fever infections; they are all caused by a virus which circulates in the blood, and is able to pass through a bacteria-proof filter; the onset of the fever is similar in many instances, and during the first two days of the illness it may be impossible to distinguish between the ailments; even later a diagnosis on clinical grounds may be unattainable, for atypical cases of dengue and yellow fever, and they are numerous, may bear every likeness to phlebotomus fever.

Dr. G. C. Low said that the differential diagnosis of yellow fever from other diseases was not an easy one. Weil's disease, acute yellow atrophy, infectious and other jaundices, had all to be considered. Further, yellow fever might occur in a malarial individual. The origin of sporadic cases of the disease had never been satisfactorily explained.

Dr. FLEMING JONES said, from a wide experience

of yellow fever cases, if he had to depend upon one symptom only in the differential diagnosis between yellow fever and other tropical fevers he would rest upon the "rising temperature and the falling pulse."

Discussion on Filariasis.

Friday, July 25, 1913.

Dr. George C. Low (London) reviewed the literature of Filariasis from July, 1912, to July, 1913. Several French writers, he said, had made contributions dealing with the geographical distribution of *Filaria bancrofti*, *F. loa* and *F. perstans* amongst natives of the French possessions on the West Coast of Africa.

Fülleborn had also published the results of his investigations in the islands of the Bismarck Archipelago, in the Pacific, and in German New Guinea. He found that a high percentage of the natives of some of the islands were infected with *F. bancrofti*, and that the embryonic forms in these areas possessed a well-marked periodicity. This is in marked contrast to the behaviour of the embryos in Samoa, Fiji, &c.

Fülleborn has also dealt with the morphology and differential diagnosis of the various human microfilariæ; it is now believed that the embryos of *F. diurna* are the larval form of *F. loa*.

Low has shown that the milky fluid occurring in some cases of chyluria originates from the lymphatics of the kidney and bladder and not from the thoracic duct, so that the condition might be termed lymphuria instead of chyluria, and suggests that the term filarial lymphuria be used to express this condition.

Wise and Minett have shown that tissues damaged by filaria become infected by organisms, with the result that abscesses form, either locally or diffused.

Several new methods of removing elephantoid enlargements have been brought forward. It would appear from the number of surgical cases of this nature reported in regions remote from the Tropics that these growths were due to other conditions than filaria.

Leiper has shown that the intermediate host of the *F. loa* is *Chrysops dimidiata* and *C. silacea*, and that metamorphosis of the embryos takes place in their salivary glands.

The geographical distribution of *Filaria bancrofti* requires further investigation and its epidemiology systematically handling. The subject of hyperfilariation also requires elucidation; the constancy of the number of embryos in the peripheral blood for long periods is another subject full of interest; and the pathology and pathological anatomy of the diseased conditions produced by *F. bancrofti* are but ill understood. Bahr's work in Fiji shows that the death of adult filariæ is fairly common, and that the calcification of the remains, which often occurs, may be a source of further trouble.

One of the most peculiar features in many cases of *F. loa* infection is the prolonged absence of embryonic or larval forms from the peripheral blood, and that even although there is strong evidence of a fair infection of adult forms. Low, in a series of cases which he is following up now, some little time ago published a continuation report upon them. A reference to this paper shows that some still have no embryos in their peripheral blood four years and even longer after their original infection.

One, however, does not give up hope of their ultimate appearance, as Meinhof has recently described a case where calabar swellings appeared in 1905, then the first adult filaria was seen six years after that, and embryos appeared in the peripheral blood eight months after that, *i.e.*, almost seven years after the original infection.

This case, with Case 5 of Low's series—a patient who has been away from the endemic area for 5½ years and yet has numerous loa embryos in his blood—indicates how long and protracted the infection may be.

Another point illustrated by the same case is that a patient may be infected and act as a carrier and yet be unaware of this, none of the usual clinical signs of the disease having shown themselves. This is rare, but it leads one to ask what are the evidences of infection with *F. loa*. Low has already entered into this in a paper on *Filaria loa*, published in the Journal of Tropical Medicine and Hygiene in 1911, but for convenience what he wrote then may be repeated here: "In coming to a diagnosis that a case is one of *F. loa* infection, four points should be attended to:—

"(1) The actual presence of the worm. Has this been seen, or has one been extracted? If so, of course, the diagnosis is complete.

"(2) The presence of diurnal (*F. loa*) embryos in the peripheral blood.

"(3) The actual presence or history of calabar swellings.

"(4) Eosinophilia with no explainable cause."

Dr. Duncan Whyte (Swatow, China) confirmed the views of Dr. Low as to the absence of hyperfilariation. Patients in whom the number of microfilariæ in 20 c.mm. of blood had been counted at a certain hour of the night, showed no increase in that number five or six years later, although there seems no reason to doubt these persons had been often bitten during the intervening years by mosquitoes which he had himself infected.

Dr. Low had given no definite information as to the duration of life of micro-filariæ in the blood-stream, and Dr. Duncan Whyte thought it worth while reporting that (in three filariasis patients from whom an elephantiasis scroti had been removed) the micro-filariæ could be found in the peripheral blood for from a week to ten days afterwards. Dr. Whyte referred to the "patchy" distribution of filariasis and elephantiasis in South China.

Dr. R. Fleming Jones (New Guinea) said he had often noted the patchy distribution of elephantiasis. In British New Guinea he found an average of 7 per cent. of blood infection with micro-filariæ (*F. bancrofti*), and yet he got nearly all his cases of elephantiasis from one small district. The suggestion of symbiosis at once occurs.

Dr. P. H. Bahr gave a lantern demonstration of changes in the tissues produced by filaria from material he collected in Fiji. In the course of his demonstration he referred to the fact that adult filariæ were found most commonly in Fiji in the lymphatic glands. In these glands were noticed giant cell formation and fibrosis, and the filariæ probably set up irritation partly by their presence as a foreign body and by their toxins and excreta. When an adult filaria dies its remains may calcify, and these possibly act as an irritant, and further increase the amount of fibrosis. Calcified remains of filaria have been found in almost every lymphatic gland of the body, the testis, the epididymus, tunica vaginalis, in the lymphatics of the kidney and the peri renal fat. Their effects on lymphatic vessels are marked blockage, which may occur in three ways: first, mere mechanical obstruction; second, by surrounding fibrosis; and third, by proliferation of the endothelial lining of the vessel wall.

Dr. Bahr also showed specimens of the development of embryos in the mosquito. The mosquito *Stegomyia pseudo-scutellaris* is the intermediate host for Fiji, and no periodicity is found in these parts.

In *Culex fatigans* the embryos develop badly, although a few may live to enter the proboscis. The *Stegomyia pseudo-scutellaris* is a day-biting mosquito, and Dr. Bahr suggests that the cause of the periodicity of the embryos in the blood of man is a distinct adaptation of the habits of the favourite intermediary host.

Professor Wasielewski (Heidelberg) suggested that a chemical effect might be produced by the filariæ and have something to do with the lesions present in filariasis.

Dr. Cameron Blair (Nigeria) referred to the periodical attacks of filarial fever and to lymphangitis. Dr. Bahr believed this was due to a definite breeding season for the parent filaria and the birth of young embryos set up the lesion.

Dr. Malcolm Watson (Malay States) referred to the "patchy" distribution of filariasis. Dr. Bahr suggested that the chemical composition of the water in which mosquitoes breed may have something to do with it analogous to the case of anopheles carrying or failing to carry malaria infection, as pointed out by Christophers.

Dr. Low then replied and answered the different questions raised. He doubted if Dr. Bahr's suggestion, that the periodicity of the embryos in the blood of man in Fiji was an adaptation to the habit of the intermediary host, could stand, because in the case of the dog *Diro filaria immitis* embryos were present by night as well as by day, though the intermediate host was a night feeder.

The President (Sir William Leishman), in bringing the proceedings to an end, said that he thought the section had every reason to congratulate itself on the highly interesting nature of the papers and discussions which had occupied them during the last three days, and he felt sure that most of the members would feel, as he did himself, that they had derived from them great and lasting profit.

Before bidding them good-bye he had two very pleasant acknowledgments to make. First, he wished to express his warmest thanks to the secretaries of the section, Dr. Curwen and Dr. O'Connor, on whom had fallen the brunt of the organization, and he assured the members that they owed them a deep debt of gratitude for their untiring and able efforts to ensure a successful meeting. Secondly, he felt sure he was only expressing the feelings of everyone present when he acknowledged in their name the warm welcome and the generous hospitality of the Brighton Division, which would make this meeting so pleasant a memory to them all.

Annotations.

Two New Genera of Helminthes in Man.—Leiper, at the annual meeting of the Society of Tropical Medicine and Hygiene, in a paper on "Remarks on Certain Helminthes in Man," described two new genera of helminthes in man from Asia.

Heterophyes yokogawa, named by Katsurada in 1912, was shown to be a new genus *Yokogawa* (type species, *Y. yokogawa*), characterized by the extraordinary absence of a ventral sucker. The genital sucker was highly developed, but did not possess the circlet of hooks or "antlers" characteristic of the genus *Heterophyes*. In other respects the parasite bore a close resemblance to *Heterophyes heterophyes*. The other known genera exhibiting this peculiar feature are *Cryptocotyle*, *Tocotrema*, *Scaphanocephalus*. In the last-named the testes lie one in front of the other. The genus *Yokogawa* is distinguishable from *Cryptocotyle* and *Tocotrema* in the peculiar restriction of the yolk glands. In this respect *Yokogawa* comes near to the *Heterophyinæ*. *Yokogawa yokogawa* is only 1 mm. to 1·4 mm. in length, and thus displaces *Heterophyes heterophyes* as the smallest fluke in man.

The *Amphistomum hominis* from Eastern India has been found to be a much more common parasite of man than was formerly supposed. A study of serial sections has convinced Leiper of the necessity of removing this species from the genus *Gastrodiscus* to a new one now named *Gastrodiscoides*, on account (1) of the presence of a large, prominent genital papilla in place of the genital atrium of *Gastrodiscus;* (2) testes tandem; (3) genital orifice on the neck, not on the ventral surface; (4) ventral aspect of the disc is smooth and quite free from sucker-bearing papillæ. The recent discovery that the pig is the normal host of this species lends added interest to the find of a new species of *Gastrodiscus* in the bush pig in Uganda and the Congo. This form closely resembles *G. sonsinoi* in the horse, but is smaller, and the genital atrium opens nearer the edge of the ventral disc.

A Supposed New Species of Human Trypanosome.—Scott Macfie, in the *Annals of Tropical Medicine and Parasitology*, August 11, 1913, Series T.M., vol. vii, No. 3A., publishes a paper on the morphology of a

trypanosome from a case of sleeping sickness from Eket, Southern Nigeria. He believes that the parasite presents differences from the ordinary *T. gambiense* and proposes the name *T. nigeriense* for it. The reasons for this are given in his summary and conclusions, which are as follows:—

"The trypanosome, of which a preliminary account is given in this paper, seems to differ in several respects from a typical strain of *T. gambiense*. In man it produces a form of sleeping sickness that is relatively mild, occurs most commonly in young people, and in which the trypanosomes are, apparently, either absent from the peripheral blood altogether, or present in such small numbers that hitherto they have not been detected. To the smaller laboratory animals the strain seems to be but slightly pathogenic. The morphology of the trypanosome as it appears in the blood of a guinea-pig shows some peculiar features. The trypanosome is smaller than *T. gambiense*, the cell protoplasm when well stained is homogeneous, and there appear constantly in the blood films a few very minute parasites measuring as little as 8μ in length. Some of the short and stumpy parasites have the nucleus situated far forwards at the anterior (flagellar) end of the body. The occurrence of a few peculiar trypanosomes which appear to have a flagellum free in its whole length is also remarkable.

Considering the morphological features of the parasite, and the peculiar symptoms of the disease produced by it, I am convinced that this trypanosome from Nigeria cannot be regarded as belonging to the same species as *T. gambiense*. I therefore propose for it the name *T. nigeriense*."

Unfortunately, it has been found impossible to reproduce the plates illustrating the paper at the same time, but it is proposed that they should appear in the next number. Until they appear criticism possibly should be suspended, but it certainly looks, as far as the paper goes, that sufficient evidence is not forthcoming for manufacturing a new species of human trypanosome.

The Extrusion of Granules by Trypanosomes.—Fry, Ranken and Plummer continue their studies on the extrusion of granules by trypanosomes and on their further development. (*Journal of the Royal Army Medical Corps*, vol. xxi, August, 1913, No. 2.) The granule when it escapes from the trypanosome and becomes free in the blood is seen to be a small spherical or pear-shaped body. In dark-ground preparations it is seen to be highly refractile, and by its activity it causes considerable disturbance in the surrounding fluid; with vital staining this young granule takes on the stain rapidly and uniformly, and seems to be undifferentiated. It frequently remains near its former host for some little time before showing independent movement. At first only a dancing movement may be seen; this, however, is a preliminary phase, and soon the granule begins to move slowly across the field, turning over on itself. There is no doubt as to the motility: they have often been observed to move out of a microscope field in preparations where there was no question of currents, &c. In the author's opinion a pseudopodial protrusion appears early, which at first is short and rather thick.

In animal infections and in cases of sleeping sickness in man, granules are found in the blood, glands, and internal organs. They are, of course, much more numerous in animals in which the adult parasites appear in great numbers. In experimental animals granules have been found in the proximal glands twenty-four hours after inoculation. This fact seems to be of great importance.

The criterion in the recognition of granules must be their motility, but their greater affinity for such stains as toluidin blue is of undoubted assistance in distinguishing them from the countless small bodies seen in wet preparations, *e.g.*, blood-platelets and leucocyte granules.

As regards the further development of these granules the further changes are difficult to follow as all stages cannot be seen in any individual preparation. The authors apparently believe, however, that the granule can develop and become a trypanosome again. Their plate (No. 9) shows this in diagrammatic form.

Plague in Manila during 1912.—Heiser, in the *Philippine Journal of Science*, vol. viii, Sec. B., No. 2, April, 1913, describes the recent outbreak of plague in Manila. He states that after an absence of six years in human beings, and five years among rats, plague was again found in the Philippine Islands on June 19, 1912. On account of the almost daily communication which Manila has with badly plague-infected foreign ports which are within a few days' steaming distance for the average vessel, and since, therefore, passengers, crews, rodents, and vermin may arrive well within the incubation period of the disease, it seems remarkable that the Philippines should have remained free from plague for so many years. During this period plague has been detected from time to time, among human beings upon incoming vessels, but such infections were invariably intercepted at quarantine. All vessels plying between the Philippines and Oriental ports have been fumigated with sulphur, at not greater than six-month intervals, to destroy rodents and vermin.

As regards the introduction of the present outbreak Heiser believes that the infection might have been introduced through the means of infected bedbugs. In a case of human plague which was taken from 508 Calle Magdalena, bedbugs were caught from the *petate* (straw mat) upon which the man died, and smears made from the intestinal contents showed plague-like bacilli; the pathological findings, however, were not confirmatory. It is not impossible that bedbugs may have been concerned in the introduction of the disease. On account of the fact, however, that all second- and third-class passengers' clothing and effects are steamed at Mariveles, it does not seem likely that bedbugs could have been introduced with them.

Hydatid Disease.—Ramsay contributes an interesting paper on unusual cases of hydatid disease, to the *Australasian Medical Gazette* for June 21, 1913. His experience extends over a period of seventeen years, and in that time he has met with many curious

examples of the disease. The following viscera have been noted to be affected—the lungs, liver, the meso-appendix, the peritoneum, and the Fallopian tubes, while cysts were also found near the bladder, in the posterior axilla, in the abdominal parietal muscles, in the neck, in the mediastinum, in the thyroid gland, in the femur, and in the antrum of Highmore. Commoner sites also invaded were the brain, spleen, kidney and breast. These examples, in the author's words, show the ubiquity of the *Tænia echinococcus* when it takes up its residence in the human body.

Correspondence.

THE RAPID DIAGNOSIS OF MALARIA.

To the Editor of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE.

DEAR SIR,—I have read in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE, May 1, 1912, Dr. Cropper's method for the rapid diagnosis of malaria, and have tried it successfully in my blood examinations in Santa Izabel Hospital, Bahia, Brazil. The method is as follows: "Thick films are made on a slide, without even a cover-slip, so thick that the blood when allowed to run to one side is seen of a bright red colour. This is rapidly dried and examined directly under a drop of cedar oil and a $\frac{1}{12}$ in. immersion." The examination can begin "before the whole film is dry, and very often the information got is sufficient before the thicker edge is properly set. The thicker part of the film is best examined first, and from the character of the pigment the species of malarial parasites can, after a very little practice, be diagnosed in most cases with great ease, almost as easily as in a wet film. The diffuse and fine dots of tertian, the compact and coarser dots of quartan, and the peculiar arrangement of the pigment in the crescents in malignant malaria are very characteristic, not to mention pigmented leucocytes."

Before I had the above information I sometimes worked with Sir Ronald Ross's method, but cannot recommend it on account of the difficulty of recognizing the parasites, more or less deformed by the watery application used in order to dissolve the hæmoglobin. On this point Dr. Cropper's method, though more rapid than the one referred to, does not solve the difficulty, as one cannot see the malarial parasites very distinctly, but only their pigments. This method may be very useful for parasitologists, but is not sufficient for the beginners in blood examinations.

In order to facilitate detection of the malarial parasites, I thought I would modify Dr. Cropper's method by staining the thick blood-films without a previous dissolution of the hæmoglobin, as recommended by Sir Ronald Ross.

I took a thick blood-film, made with five large drops of blood, and when dry I stained half of the blood with a methylene-blue acid solution (Gasis's solution) without fixing and with about two minutes' careful washing. When dry, I examined it under a drop of cedar oil and a $\frac{1}{12}$" hom. Leitz's oil immersion objective. I was rewarded, as I could see very clearly, not only the melanin pigment as detected by Dr. Cropper's method, but also the whole malarial parasite with its unchanged morphology, just as on the dried and stained thin films of the common method of examining malarial blood.

Upon careful consideration I discovered the success was due to the fact that the staining was performed at the same time as the acid solution influenced the erythrocytes, dissolving their hæmoglobin; so that, in two minutes, one could see the parasites stained in blue, as the nuclei of the leucocytes. I think this modification very useful in tropical work, and, as I stain only a half of the blood-film, it is not difficult to make a comparison of the two halves of the same slide, in order to recognize the advantages of my staining method. After this discovery the method was practised daily in my medical clinics at the Bahia Medical School, where it met with the approval of my assistants and pupils alike, as the best method of detecting rapidly the malarial protozoon.

In a patient under my observation suffering from malarial motor aphasia, who was dumb during twenty days, the detection of the parasites was easily made and their disappearance observed daily by the aid of my method of staining the thick blood films. The patient recovered, as I explained in the medical journal, *Brazil Medico*, of Rio de Janeiro, and in my lecture, "Um caso de aphemia transitoria palustre" (A case of malarial aphemia).

I should be glad of the advice of scientists and practitioners upon this small contribution for the examination of malarial blood, and should be pleased to receive any criticisms of my remarks.

The technique I adopted was as follows:—

(*a*) To make the films very thick with five large drops of blood.

(*b*) After the blood is dry, to stain it (two minutes) with Gasis's solution:—

Methylene-blue	... ...	1 grm.
Hydrochloric acid	... ...	0·5 c.c.
Alcohol	... ...	10 ,,
Distilled water	... ...	90 ,,

(*c*) To wash with care, to dry, and to examine the films under a drop of cedar-wood oil and a $\frac{1}{12}$" oil immersion objective.

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Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

PLAGUE.

Report by Major W. Glen Liston, C.I.E., M.D., D.P.H., I.M.S.
Bombay Bacteriological Laboratory.

The Epidemiological Features of Bubonic and Pneumonic Plague Contrasted.

Major Liston said that the historians of plague did not differentiate clearly between the pneumonic and bubonic types of plague; nor is this surprising, for, in epidemics in which the two types are associated together, plague is obscured by the occurrence of cases of secondary pneumonia in typical bubonic cases.

The discovery of the plague bacillus by Kitasato and Yersin in 1894 enabled Childe, of the Indian Medical Service, in 1897 to distinguish clearly between the pneumonic and bubonic types of this disease. He showed that enormous numbers of plague bacilli are ejected with the sputum of patients suffering from plague pneumonia, and he also drew attention to the infectious nature of this form of disease. Subsequent epidemics, although not very infrequent, were always limited, for prompt and effective precautions were taken to control the spread of infection; the fact remains, however, that these pneumonic epidemics arise from time to time in connection with bubonic cases, taking origin, no doubt, from bubonic cases which have developed symptoms of secondary pneumonia.

Meanwhile the connection between rats and the bubonic form of the disease attracted attention both in Hong-Kong and in Bombay, but the relationship between the epidemic and epizootic was particularly clearly demonstrated by Ashburton Thomson during the outbreak of plague in Sydney in 1900; Thomson also brought forward arguments to support the view, advanced by Simond in 1898, that fleas conveyed the infection from rats to men.

The experience of medical officers in charge of the plague hospitals in Bombay forced upon them the conclusion that cases of bubonic plague, removed from their homes to the hospital, were peculiarly non-infectious, for relatives and friends, ignorant of the very elements of disinfection and closely in attendance on these patients, never contracted the disease. Bubonic plague thus came to be regarded as a disease of locality, for infection appeared to lurk in the homes of the sick, rather than with the sick themselves. As a consequence of this view a long series of fruitless attempts were made by a large number of observers to isolate the plague bacillus from the floors and walls of infected houses. Experiments, however, showed that, exposed to the conditions found in nature outside the body of a living animal, plague bacilli rapidly disappear, so that they cannot for long be recovered from contaminated soil or clothing placed under normal conditions.

Major Liston also turned his attention to fleas as harbourers and transporters of the plague bacillus. He observed that certain species of fleas readily took to other than their natural host, especially in the absence of their natural host, and in 1904 experimented with guinea-pigs, utilizing these animals to attract rat-fleas in plague-infected houses, so that the fleas could be caught in the fur of the guinea-pigs, when they were chloroformed and examined. By means of these guinea-pig flea-traps I was able to show that plague bacilli could be found in plague-infected houses in the stomach of fleas which had probably sucked the blood of infected rats; these rat-fleas readily took to and bit guinea-pigs, which were used to capture them, so that some of the guinea-pigs died of plague, the bacilli being conveyed by the fleas from infected rats to the guinea-pigs. In the stomach of fleas the bacilli were observed to multiply, and it seemed likely that they could thus be transferred most easily from the blood of sick to the blood of healthy animals. He proved also that rat-fleas under certain circumstances could be captured on men, so that it seemed possible that plague infection was in this way transferred from rats to men.

Meanwhile Gauthier and Raybaud had shown in 1903 that it was possible in laboratory experiments to convey infection from sick to healthy animals by means of rat-fleas. The Plague Research Commission in India showed that bubonic plague, whether in animals or men, must generally (that is, in the overwhelming majority of cases) be produced by infection carried by means of rat-fleas from infected rats. The bubonic type of plague was thus proved to be not directly infectious.

The International Plague Commission appointed in 1911 by the Chinese Government to study pneumonic plague in Manchouli, a region which has been associated for years with outbreaks of pneumonic and bubonic plague, which have their origin from an epizootic among tarbagans, spread through Manchuria, claiming a death-roll of 50,000 persons during a period of six months. This International Commission made it abundantly clear that in this epidemic rat infection played no part. The disease was spread by direct infection from man to man. Despite the fact that vast numbers of plague bacilli were ejected from the sputum of the sick, who were often huddled together in houses in which rats were numerous, it is noteworthy that no evidence was obtained of infection among the rats either acquired by feeding on the sputum of the sick, or on food contaminated with sputum, or by feeding on or gnawing the exposed plague corpses. No evidence was forthcoming incriminating articles of clothing as agents in the transmission of the infection, or proving that houses were infected apart from the plague patients within them.

Dr. Strong, one of the members of the Commission working with Dr. Teague in Manila, has shown that the strains of *Bacillus pestis* isolated from pneumonic cases in China in no way differ from strains isolated from bubonic cases in other parts of the world. They have shown that plague bacilli from a pneumonic strain, when injected subcutaneously into animals, produce the bubonic type of the disease, and that the virulence of these strains is not greater than the virulence of bubonic strains.

In discussing the method of infection in plague

pneumonia, Strong has shown that plague bacilli are not usually expelled by means of the expired air during normal or dyspnœic respiration by persons suffering from primary plague pneumonia, but that during coughing, even when sputum visible to the naked eye is not expelled, plague bacilli in large numbers may become widely disseminated into the air surrounding the patient. He states that the distance from the patient that the air may become infected by droplets containing plague bacilli varied largely with the strength of the cough, the amount of mucus in the throat and larynx at the time, and the currents of air in circulation in the ward. He omitted to consider the very important influence of temperature on the distance to which infection may diffuse, for it is likely that droplets carrying plague bacilli will float through the air for a longer period in a cold damp atmosphere than in a hot dry one. It is for this reason, Major Liston believes, that the pneumonic type of the disease is more common in cold and temperate climates than in hot tropical countries where generally the bubonic form of the disease prevails.

The International Commission further came to the conclusion that the chief factor in the decline of this pneumonic epidemic was probably the preventive measures, which were adopted either in accord with scientific methods, or by the efforts of the people to protect themselves. The widespread epidemic in China was easily checked when suitable measures were adopted, as are the small pneumonic plague epidemics which occur from time to time in India. But this experience differs entirely from that obtained in India in regard to bubonic epidemics, for that type of the disease has been present there for nearly sixteen years, despite the most strenuous efforts on the part of Government to eradicate it.

The Immunity of Mus rattus to Plague Infection.

When plague broke out in Bombay in 1896 the disease had been absent from that city since 1702, a period of 194 years. "These long intervals," says Simpson, in his "Treatise on Plague," "seem peculiar to the epidemiology of plague. Between the epidemic in London in 1348 and that of 1499 a period of 150 years elapsed, an interval of seventy years occurred between the epidemic of 1720 and the previous great epidemic in Marseilles, and in other localities similar intervals obtained.

Any theory of the method of propagation of plague must take cognizance of these phenomena and be capable of explaining, not only the gradual decline in the severity of succeeding epidemics, but also the period of immunity which follows them.

At Bombay Bacteriological Laboratory during six years 701,624 rats have been examined, and 69,191 of that number have been found infected with plague. The result of this examination shows that an approximately close relation is maintained between rat and human plague, not only in regard to the onset and decline of the epizootics and epidemics, but also in respect to the general course of each epizootic and epidemic. In 1907, for example, both epizootic and epidemic steadily increased in severity till the end of March and then rapidly declined; but during the year 1910 both epizootic and epidemic persisted at a moderate intensity for some weeks during the months of March and April.

Granted that epidemics of plague are dependent on rat epizootics, certain experiments carried out by the Plague Research Commission in India explain why succeeding epidemics of plague in an infected town gradually decrease in severity, and why, after a succession of epidemics, the disease disappears and the place remains free from infection for a comparatively long period of years.

In connection with the epidemiological and experimental researches on plague in India, the Commission had frequently to bear in mind the possibility that the immunity or resistance of rats to plague infection might be a factor of some importance in the epidemiology of this disease. For example, the gradual increase in the number of rats immune to plague might be a factor in terminating an epizootic. It was noted that the rats which survived an epizootic, which had been produced by introducing infection among the fleas in our experimental godowns (sheds), showed an apparently high degree of immunity, but it was thought that this immunity might be explained by supposing that during the epizootic susceptible individuals had been killed off and that the more immune had survived, rather than that the rats had acquired immunity in having suffered and recovered from the disease. It was also observed that the rats in Belgaum town were able to withstand a dose of plague bacilli which experience had shown would have killed a fair number of rats caught in Bombay. Rats were collected in Bombay from several places and a large number of them infected at one time with the same dose of plague.

A brief description of the first experiment will serve to explain the technique adopted in the others. One hundred rats caught in Madras, and the same number caught in Bombay, together with seventy-six caught in Poona, were placed in separate cages, two rats in each cage. The spleen of a rat which had died of acute plague was removed aseptically, and placed in a sterile mortar and ground up with a known quantity of saline solution. The larger particles of this emulsion were allowed to settle and the supernatant fluid was decanted off; to this emulsion of plague bacilli fresh saline was added as necessary, so that 1 c.c. of the ultimate solution contained what we regarded as the equivalent of one one-hundredth part of a milligram of the infected spleen. This dose was administered subcutaneously in the majority of our experiments. Later the technique was improved by ascertaining the actual number of living bacilli in each cubic centimetre of the emulsion used by planting out measured quantities of the emulsion on agar tubes and counting the number of colonies of plague bacilli which developed.

The result of the first experiment showed that, while 83 per cent. of Madras rats died of plague (the remainder in this experiment having died of causes other than plague), only 44 per cent. of the Bombay rats and 30 per cent. of the Poona rats succumbed to the disease. Madras rats, therefore, were highly susceptible to plague, while Bombay and Poona rats were comparatively immune to the disease.

Now, Madras City has been practically free from plague, while both Poona and Bombay have suffered severely, the former more severely than the latter in proportion to its size.

Rats were caught in other parts of India where there had been no plague, and we found that rats from Dacca, Madura, and Banda, for example, all of which towns had been free from the disease, were as susceptible to plague as Madras rats were found to be. These experiments showed:—

(1) That the method of subcutaneous inoculation of one one-hundredth part of a milligram of a selected plague-infected rat spleen, or approximately 18,000 plague bacilli, was a more severe test of the immunity of rats to plague than that which we were able to bring about by flea infection in a place like Bombay.

(2) That in a given batch of rats the degree of immunity was relative to the infecting dose.

(3) That the immunity of the rats was greatest in places which had suffered most severely from plague, less marked in those places which had suffered to a moderate extent, and least in those places in which epidemic plague had not occurred.

By the nature of this immunity, although the rats used all conformed to the type *Mus rattus*, it was possible to discover special and characteristic features in specimens from certain places, not as a rule wholly confined to any one locality, but being predominant in one place more than another. Thus the fur of Madras City rats is exceptionally rufous; rats from the colder northern places had thicker fur than southern specimens; and Belgaum rats were on the whole larger than those caught in Bombay or Poona. But no external difference could be detected in the rats of Lucknow, Cawnpore, and Banda, all situated in the United Provinces, yet, on testing these rats by inoculation, Banda rats proved to be as susceptible to plague as Madras rats were, while Cawnpore and Lucknow rats were both highly immune, the former markedly more than the latter.

The conclusion, therefore, is that the resistance of rats to plague is associated with the past prevalence of plague. In what manner is this resistance developed?

It became necessary to ascertain whether the observed immunity of the rats from the places tested was an acquired or a natural immunity, using these terms in the sense usually employed by bacteriologists; and experiments conducted for this purpose gave the following results. Adult Madras rats were tested against young Poona and young Bombay rats on a number of occasions; the summed up results of comparative experiments showed that of 500 Madras rats 98 per cent. died of plague; of 450 young Poona rats 30 per cent.; of 450 young Bombay rats 46 per cent. Young rats from Poona and Bombay, therefore, were only slightly more susceptible to plague than adult rats from these places, and were markedly immune as compared with adult Madras rats. These experiments proved that young rats from Poona and Bombay inherited their immunity from their parents, for it was not acquired by exposure to infection. Further proof was afforded by testing rats bred in captivity from Bombay stock, and comparing them with wild Bombay rats, and with Madras rats. Two hundred and twelve Madras rats had 208 deaths from plague, 98 per cent. mortality; 248 rats caught in Bombay had 65 deaths, a mortality of 26 per cent.; while 158 rats bred in captivity from Bombay stock had 41 deaths, a mortality of 26 per cent. Hence it appears that the resistance found is not due to previous reception of plague bacilli during the prevalence of epizootic plague, but to the generation of an immune progeny by the survivors of epizootics. Susceptible rats appear to be killed off in the course of repeated epidemics, while the more immune survive, transmitting their immunity to their offspring.

Major Liston concluded by saying that the decreasing severity of epidemics in a particular town which has suffered from repeated outbreaks of plague is due to the generation of a race which is comparatively immune to plague by a process of selection and survival of the fittest, and it is not difficult to understand that under these circumstances such a place may remain for a time at least free from epidemics of bubonic plague.

In the experiments he recorded *M. rattus* was used, for some recent experiments seem to show that the conclusions arrived at for *M. rattus* are not applicable to *M. decumanus*.

INVESTIGATIONS AS TO THE RELATIONSHIP OF THE TARBAGAN (MONGOLIAN MARMOT) TO PLAGUE.

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The North Manchurian Plague Prevention Service.

Immediately following on the International Plague Conference, held in Mukden in April, 1911, the Chinese Government, anxious to carry out the recommendations of the conference, instituted the North Manchurian Plague Prevention Service. The chief of these recommendations were briefly:—

(*a*) Systematic investigations should be made as to whether epizootic occurs among tarbagans and other rodents, and, if such exists, an accurate investigation should be made of the nature of the infection.

(*b*) A general improvement in the sanitary condition of cities and villages, especially with regard to overcrowding, is desirable.

(*c*) Education of the public by lectures and the issue of pamphlets and handbills, explaining preventive measures in simple language.

(*d*) The need for isolation of pneumonic plague patients being urgent, permanent hospitals should be available.

(*e*) Hospital accommodation for suspected cases of plague should be provided.

(*f*) Contact quarantine stations should be constructed.

Among the delegates of the International Plague Conference, Mukden, April, 1911, it was generally believed that there was a close connection between plague—or at least the recent epidemic of pneumonic plague of Manchuria—and the tarbagan or marmot (*Arctomys bobac*, Schreb).

So little was known about this animal and the grounds for associating it with plague were based on such slender scientific evidence that it seemed to me the first step in the investigation of this question was to organize an expedition into the country where the tarbagan abounds, and there to study its habits and the conditions under which it lives, and to carry out scientific investigations as to the presence of plague among the animals.

For the sake of clearness, it is well to state here that the tarbagan hunting is divided into two seasons:—

(1) Spring season, lasting from the end of April to the beginning of June.

(2) Autumn season, lasting from the middle of August to the end of September.

In the beginning of July rumours were afloat that a large number of tarbagans were dying in the neighbourhood of Scharasone (Transbaikalia, Siberia).

A correspondent stated that "the tarbagan epidemic of Siberia is spreading southwards towards the Chinese frontier. Dead marmots are now found as far south as Scharasone, which is only thirty-five miles north of the Russian-Chinese frontier. Local measures are sufficiently strict to prevent the disease from entering Manchuria."

Manchouli is situated in Chinese territory at the junction of the Chinese Eastern and the Trans-Siberian Railways, and is about ten miles east of the frontier between the province of Heilungkiang and Siberia. Here are established the Chinese and Russian Customs for the examination of goods and baggage passing along the railway from one country to the other.

Altogether the population of Manchouli may be estimated as consisting of 8,000 Russian civilians, customs officials, &c., 3,000 Russian troops, and 2,000 Chinese, most of whom are of the coolie class.

Occurrence of Plague at Manchouli and Surrounding Districts.

In 1908 Professor Zabolotny was in Mongolia and found plague in the region he visited. Between this date and 1905 no reliable information as to the occurrence of the disease in or around Manchouli could be got. The outbreaks of plague which had occurred in this district since 1905 were:—

1905.—Plague occurred in August at Dalai Nor (14 cases) and in Manchouli (4 cases). Total, 18 cases. Bubonic type.

1906.—Plague occurred in Abagaitui (Russian territory) (15 cases), and in Manchouli (2 cases). Total, 17 cases. Pneumonic type.

1907.—One case was imported from Transbaikal territory into Manchouli. Bubonic type.

1908.—There were no cases of plague in Manchouli, but there was reason to believe that the disease was present among the Mongols along the Argun River. There is some doubt as to the type of the disease, but it seems probable that it was pneumonic.

1909.—No cases reported.

1910.—The last epidemic with 400 cases at Manchouli. Pneumonic type.

1911.—End of August, 5 cases at Scharasone, 4 deaths. Bubonic type.

1912.—Beginning of September, near Chita (capital of Transbaikalia), 3 cases, all fatal. Evidently pneumonic type (confirmed by P. Haffkine).

In considering the occurrence of plague at and around Manchouli, it must be borne in mind that the disease is endemic in the Khirgiz Steppes, and from time to time this has travelled eastwards, giving rise to sporadic outbreaks in Eastern Siberia.

Concerning the outbreak of pneumonic plague at Manchouli in the autumn of 1910, the following occurs in Dr. Ch'uan Shao-ching's paper read at the International Plague Conference:—

"Observations reported to me by Chinese residents at Manchouli show that two carpenters who lived in the house adjoining Wu Kuei-ling's Inn died with spitting of blood on October 10. These two carpenters had been in the service of a foreman named Chang Wan-shun at Dawoolya (Daurija), a railway station in Siberia situated some six miles west of the boundary line. Chang Wan-shun told me that six or seven of his carpenters had died with blood spitting in Dawoolya on September 16, and said he believed that plague had appeared in Dawoolya before it was known in Manchouli. 'Later on it was found that nine out of twenty coolies, who lived in a small room in Wu Kuei-ling's Inn, were suddenly taken ill with blood spitting. One of them was sent to the Russian Plague Hospital, and it was discovered that he suffered from pneumonic plague. Two died in the house that same night, but the rest ran away to different places in the town, and thus disseminated the disease.'"

Prohibition of Tarbagan Hunting.

During February, 1911, the (Chinese) Prefect of Manchouli prohibited the hunting of the tarbagan, the penalty for disobeying this order being two months' imprisonment, and a further order increased the punishment to six months' imprisonment.

On August 11, 1911, a general order was issued by the Russian authorities forbidding trade in marmots, including hunting of animals, preparation of

skins, salting of the flesh and fat under penalty of a fine of 500 roubles or three months' imprisonment.

Up to 1908 comparatively few Chinese hunted the tarbagan. In the autumn of that year and in the autumn of 1909 several thousand Chinese, attracted by the high price paid for the fur, were in the neighbourhood of Manchouli, and in 1910 the number reached 10,000 hunters.

Owing to the Chinese order prohibiting the hunting of tarbagans, there were fewer Chinese in Manchouli during 1911 than formerly.

The Inns.

There can be no doubt the unhygienic nature of the inns provided for accommodating fur hunters has much to do with the spread of pneumonic plague.

The inns are of two kinds—those entirely underground and those partly above-ground and partly underground.

The accommodation in both types of inns is based much upon the same plan. Two, and sometimes three, tiers of berths for the lodgers are present, there being just room enough between the tiers for a man to sit up. In one house I visited there were 40 berths, the measurements of the room being only 25 ft. square and 14 ft. high. Even in May the rooms were ill-ventilated and stuffy. In winter, when all the windows are closed and the fires are lighted, the stuffiness must be great. The windows are closed, and there is a heating stove in the middle of the room. The usual way of heating these inns is by means of a *k'ang* on either side of the central passage leading from the door. A *k'ang* is a horizontal brick flue about 5 ft. wide and 2 ft. high, at one end of which is an opening where is lighted a fire of wood or *kaoliang* (millet) stack. At the other end of the *k'ang* an opening is made through the outside wall of the house, and leads to a chimney for the escape of the smoke.

They sleep in rows with the head against the wall and the feet towards the central passage. There is no partition between adjoining berths, so that they easily breathe and cough into each other's faces.

From 1908 to 1910 so many people came to the districts to hunt the tarbagans that the owners of the inns packed the men in every available space, extra tiers being added whenever possible above those already existing.

Note on the Fur Trade at Manchouli.

The tarbagan hunting is divided into two seasons:—

(1) The spring season, lasting from the end of April to the beginning of June.

(2) The autumn season, lasting from the middle of August to the end of September.

The early spring fur, owing to its being lighter in weight, is more valuable than the heavier fur obtained in the autumn season. The fur of the tarbagan is thick, soft, and very serviceable in winter; but up to five years ago the export was not great.

It is estimated that in 1910, however, 2,000,000 tarbagan skins in all were exported from Manchouli. In June, 1913, over 4,000,000 tarbagan skins were lying at Manchouli ready to be carted by road to Mazijewsskaia for export to Europe.

Owing to the increased demand for skins and the consequent rise in price, large numbers of coolies—and especially those from Shantung—were attracted to the spot, and the agricultural peasants left their fields to become tarbagan hunters. The tarbagan skins are mostly sent to Leipzig and London to be cured.

Professor Zabolotny mentioned that a tarbagan had been caught on June 24-26 near Scharasone on the Siberian side of the border suffering from plague; the animal died soon afterwards. From one of the cultures obtained, Zabolotny inoculated a healthy tarbagan on the right leg, and produced two large buboes in the right groin only. The animal died of septicæmia.

Four other tarbagans were suspected to have died of plague, but it was found later that none of the cases were plague.

WORK AT BORSJA, JULY 22-29, 1911.

Borsja (Siberia) is 121 versts west of Manchouli on the railway, and is the centre of tarbagan hunting in the Transbaikal district. During our stay there no hunting was being carried on, as this had been forbidden, but special permits to hunt were given to skilled Russian hunters, who were instructed to bring in specially any sick tarbagans.

Forty tarbagans were kept for observation in the cages; when we had satisfied ourselves that they were perfectly healthy they were released, and others put in their place. In this way about eighty tarbagans came under observation.

During the week we spent at Borsja no sick tarbagans were brought in, and none of those under observation showed any sign of disease.

On the following morning we got up at 4 a.m. to see if the tarbagan came out from its hole at dawn seeking food, as some believe to be the case. But during the next six hours we did not see more than five tarbagans.

We went out all around the neighbourhood of Borsja, and although we inspected many holes, no trace of a sick animal was found. On July 27 a dead tarbagan was found four versts away, but did not reveal any *Bacillus pestis*.

While at Borsja we performed experiments to try and ascertain if cannibalism was common among tarbagans. In one of these an animal was starved; after some days a dead animal was introduced into the same cage, but at the end of five days the carcass had not been mutilated.

WORK IN MONGOLIA, AUGUST 3-14, 1911.

Tarbagan Ta Hu, 30 *li* south-west of Manchouli, August 4, 1911, lies near a small lake of briny water. Mosquitoes were present in enormous numbers, the air being black with them. They consisted of culex principally, and *Anopheles maculipennis*.

Later I found that the Mongols complained of fever, and since anopheles was present in this

neighbourhood, one presumes the disease they complained of to be malaria.

From inquiries made among Mongols, I learnt that there had never been any outbreak of disease resembling human plague in their midst. Nor could I obtain any word of disease among the tarbagans; the country in which they had lived for many years past abounds in tarbagans, yet they had never noticed the animals dying.

In the country around Manchouli, although plenty of tarbagan holes were met with, few of the animals were seen, and our traps seldom caught any. The country had been used for pasturage by the Mongols and large stretches had been fired. From this it would seem probable that, when food becomes scarce in one region, the tarbagans migrate to regions where food is plentiful.

The Mongols.

At Charbada and Kulun See we camped with Mongols, and thus had opportunities of studying them and their habits. The Mongols at Charbada were apparently quite wealthy, though they lived in a most primitive way.

The huts are round and domelike, measuring about 15 to 20 ft. in diameter, and consist of a series of movable wooden framework 4½ by 2 ft. in size, oblong in shape, and covered by felt-matting made of camel's hair or sheepskins. On the floor is laid felt-matting, on which the inhabitants sleep. The furniture consists of a few wooden chests where clothes and money are kept, a Buddhist shrine, a cooking pan and stove, and a box containing dried cattle-dung, which is used as fuel for cooking.

The Mongols drink a large quantity of cows' and goats' milk, and they eat, besides mutton, a good deal of tarbagan flesh, which is only half roasted before the primitive fire.

The Tarbagan or Marmot (Arctomys bobac, Schreb.)

The species to which the tarbagan belongs is known in America as the woodchuck (*Arctomys monax*). The Russians called it "szuriok," and the Chinese "Han T'a"; but the name most familiar is the one adopted by the members of the International Plague Conference, namely, "tarbagan," a term derived from the Mongols.

The rodents are divided into two groups, namely:—

(*a*) The simple-toothed rodents, *e.g.*, squirrels, rats, mice, and porcupines, and to this group the tarbagan belongs.

(*b*) The double-toothed rodents, *e.g.*, hares and rabbits.

The particular variety of marmot found in Manchuria and Mongolia is identified as *Arctomys bobac*, Schreb. (or the true marmot).

The following are some of its distinguishing features:—

The body is stout and the limbs are short. The tail is bushy and comparatively short, being about one-half the length of the body. The head is wide and short, and there are no cheek pouches. The ears are small and more or less rounded. Of the five toes, the thumb is rudimentary, being supplied with a flat nail, whilst the claws of the remaining four are long and exceedingly sharp. The fur is of moderate length and of a fine texture. The general colour tends to change at different seasons of the year, varying from a light greyish brown in the spring to a reddish brown hue in the late autumn. On the back and around the eyes the fur is darker in colour. The length of the adult animal, exclusive of tail, varies from 15 to 18 in. (37 to 45 cm.), and the weight of the adult animal varies from 9 to 12 lb. (4,100 to 5,400 grm.), being greater as the hibernating season approaches.

The temperature of tarbagan taken *per rectum* presented wide variations in different animals and in the same animal at different times—even in apparently perfect health. Thus, in some it was found to be 95° F., in others 96° F., in others again 97° F., and so on until in one animal 107·6° F. was registered. This last case was particularly interesting in that this temperature was taken soon after capture. It died, however, twenty minutes after the temperature was taken, and sixty-one minutes after capture. At the *post-mortem* nothing abnormal was found. In one of the animals the temperature varied from 98·5° F. to 104·8° F. within the space of three days.

Distribution of the Marmot.

The marmot inhabits a wide range, but is confined to the Northern Hemisphere. In North America the common species is the woodchuck, the distribution of which is from the Carolinas northward to Hudson's Bay, and westward from the Atlantic Coast to Missouri, Iowa, and Minnesota; but other species are met with in the Rocky Mountains and in the north-western parts of America, even as far as the Arctic Regions.

In the Old World, the best known species are the bobac (*Arctomys bobac*, Schreb.) and the Alpine marmot (*Arctomys marmota*). The region of the former extends from the south of Poland and Galicia over the steppes of Southern Russia and the bare regions of Siberia to Northern Mongolia, North-west Manchuria, the Amur regions, and so on to Kamchatka, whilst it is found in elevated regions as far south as Cashmere, Thibet, and the Himalayas, but the southern limits have not been defined accurately.

The Alpine marmot is confined to the higher regions of the Alps, Pyrenees, and the Carpathians. A small species (*Spermophilus citellus*, Linn) is found in abundance in South Manchuria, especially around the neighbourhood of Mukden. This species bears little resemblance to *Arctomys bobac*.

In the regions where the tarbagan abounds, it can easily be seen either running about on its four legs or standing on its hind legs. On the approach of a stranger they let fall the front paws, and immediately retire into the burrows, to come out again as soon as they feel the danger is past. The tarbagan in captivity is a very fierce animal, using his front feet freely and biting deeply those who come

in his way. With his sharp claws he scratches effectively when carelessly handled. For dealing with those we had in cages, strong forceps of considerable length had to be made, each blade curved so as to give a firm grip on the neck or body. When placed in a wooden cage, lined with parallel bars of soft iron, ½ in. in diameter, the animal escaped in a very short time by bending the iron rods with his strong jaws and by biting the wood of the cage with his sharp teeth. This same rod an adult was unable to bend.

Habitat.

The tarbagan regions of North Manchuria and Siberia are well seen from the windows of the Trans-Siberian trains between Hailar and Chita, extending for a distance of 650 versts. The characteristic mounds are present everywhere, especially to the north of the line, and not uncommonly the animals are visible sitting outside the entrances to their burrows.

Regarding breeding, there is reason to believe that the tarbagan is not as prolific as the rabbit—two or three being the average number of young ones born each season.

The tarbagan hibernates from October to April. Indeed, marmots seem to be the most thoroughly hibernating of all mammals, since their sleep is apparently unbroken, and they lay up only a small store of winter food, consisting of grass, roots, and the seeds of plants. With the return of spring comes renewed activity on the part of the animals, and they venture into the open. Hence the hunters choose the months of April, May, and June for hunting them. July and August is the breeding season, and the Chinese authorities forbid trapping during these months. After August they are again hunted until the approach of cold weather—about the end of September.

Method of catching the Tarbagan.

The method adopted by the Cossack and Chinese hunters for catching tarbagans consists of a piece of medium-sized iron wire, 2½ ft. in length, with one end twisted in the form of a running loop, whilst the other end is wound firmly around a rough wooden peg ¾ foot long. The peg is driven into the ground immediately above or on the side of the entrance to the burrow, and the loop is arranged so that it fits exactly into the opening.

After capture the animal is killed by a method called "breaking the neck." Skinning is performed by incising the two corners of the mouth, separating the skin from the soft parts of the jaws and then pulling the complete skin from before backwards and from within outwards, *i.e.*, the skin is turned inside out.

Besides using the fur, the Siberian settlers and Mongols eat the flesh of the tarbagan. When at Charbada the members of our party partook of the flesh, and found it tender and the taste distinctly good, comparing favourably with the flesh of the rabbit. Considerable quantities of the flesh are salted and exported to European Russia.

In addition, the fat, which is plentiful under the skin of the animal, is turned into a valuable kind of grease, much used by Russian peasants for preserving leather. They also apply it for the healing of bruises.

Parasites of the Tarbagan.

In its natural state the tarbagan harbours two kinds of blood-sucking arthropods, namely, the flea and the tick. The fleas were more numerous on the animal when freshly caught than after it had been in captivity for some time. Most of the fleas were caught in the groins, but often they were distributed over the whole body. The ticks were usually attached to the eyelids, but on one occasion we found two ticks on the abdomen, and none on the eyelids. The number of fleas per animal varied greatly even just after capture. All the fleas were of the same species, namely, *Ceratophyllus silantievi*, Wagner, 1898.

Biting Experiments with Fleas and Ticks obtained from the Tarbagans.

The insects were removed from the tarbagans directly the animals were caught, and were placed in test-tubes.

The following experiments were carried out:—

Experiment 1.—When at Charbada, some six fleas in a test-tube, immediately after their removal from the tarbagan, were given the opportunity of biting one of us. Even after several minutes none of them had bitten.

Experiment 2.—August 10, 1911. *Ceratophyllus silantievi*, 1 ♂, starved for three days. Then given facilities for biting the arm of one of the party. The insect moved about for some minutes before biting. It chose a spot in a fissure of the skin, and plunged its proboscis deep in. While sucking its body was tilted upwards, and the insect was seen to increase in bulk. It remained thus for eight minutes, and then, having withdrawn the proboscis, fell on its side. Afterwards it began moving around less actively than before.

The person bitten experienced no pain and very little sensation, both when the flea pierced the skin and during the time the insect was sucking. After the flea had withdrawn its proboscis the site of puncture was barely visible to the naked eye, and with the aid of a hand-lens a very slight escape of blood was seen to have taken place from the puncture. There was no after-swelling or irritation.

The ticks (sp. *Rhipicephalus*) were collected in test-tubes, and similar experiments to those with the fleas were carried out. In no case did a tick bite the arm of a human being, although the tick used in one experiment had been starved for eight days.

EVIDENCE ASSOCIATING THE TARBAGAN WITH PLAGUE.

The tarbagan has been said to suffer from a chronic form of plague not unlike the form seen in rats. From time to time epidemics have been reported as occurring among the tarbagans, causing them to die in thousands. It has been said that

hunters easily recognize the sick animals—these often being driven out from their holes to wander about aimlessly until they die. The piteous state of these animals has been graphically described.

If a human being takes plague, and has eaten of the flesh of the tarbagan—a very common food among the Mongols and Cossacks—it has been stated forthwith that this is the source of infection. Indeed, whenever a case of human plague occurs in a remote district of the tarbagan country, it is stated almost invariably that the disease has resulted from the eating of tarbagan flesh.

It need scarcely be said that before a diagnosis of plague is established a complete bacteriological examination must be made. It has been definitely established that rats suffer from plague, and from them the disease is conveyed to man. The chronic form of plague has been found among the gophers or ground-squirrels (*Citellus beecheyi*) of the mountains of Western America by McCoy. Mice and guinea-pigs are susceptible to artificial infection with *Bacillus pestis*. Strong and Teague, Zabolotny, Dujardin, Beaumetz, and Mosny have shown that the tarbagan also is susceptible, and Shibayama has demonstrated that *Spermophilus citellus*, the small species of marmot common about Mukden, is susceptible to plague, though not so susceptible as the rat.

Since these rodents are susceptible to plague, and since the disease occurs in nature among rats and ground-squirrels, *a priori*, it is conceivable that it occurs among tarbagans in nature.

An epidemic among the tarbagans was reported in July, 1911, and the Russian and Chinese expeditions at once visited the country where this epidemic was supposed to exist. Not only did the expeditions fail to discover a single diseased tarbagan, but inquiries made directly from the hunters showed that they knew nothing of the alleged epidemic. In the experience of these hunters, not only had no epidemic ever occurred among the tarbagans, but they had never even seen sick ones. In Mongolia the Chinese expedition had similar results, nor could any news be obtained of disease, past or present, from the Mongol hunters.

Although the tarbagan hunters dispersed in pursuit of their business, staying away for one or several weeks, they usually reassembled at the regular camps, there to skin the animals captured, yet there is no history of plague among them. Moreover, although millions of tarbagan skins were exported yearly to Europe, and thus handled by hundreds, perhaps thousands of people, from the hunter and the railway porter to the factory labourer, no case had ever been reported of plague infection in human beings during the transit of such skins. It is also very doubtful whether plague occurs as a result of eating plague-infected flesh. As bearing upon this question, the following may be quoted: "In many instances during the Manchurian epidemic, the patient with pneumonic plague must have swallowed enormous numbers of plague bacilli in the saliva and sputum. Nevertheless, in none of the necropsies performed during the epidemic were evidences of primary intestinal infection present, nor was serious involvement of the intestine encountered. This fact certainly strongly speaks against the evidence of primary intestinal plague in man, and would seem to show that even if the intestines are sometimes secondarily involved, this condition in human beings must be also a very rare one" (Strong and Teague).

The only definite proof that tarbagans in nature are affected with plague is obtained from the animal caught by Dr. Issaief, June 24-6, in Scharasone, and examined by Dr. Zabolotny.

To conclude that a man whose occupation is that of a tarbagan hunter, and who takes plague, has been infected from a tarbagan, is comparable to concluding that a man who sells rice, and who develops plague, has been infected from the rice.

Conclusions.

Even though the tarbagan occasionally suffers from plague the epizootic is never extensive, and the animal does not play nearly so important a *rôle* in the spread of plague as does the rat. Indeed, its direct relationship to human plague may be considered negligible.

From the writings of Russian authorities, it appears that plague has existed for many years in various parts of Siberia, sometimes in the bubonic form and sometimes in the pneumonic form. These places may be looked upon as endemic foci.

Other papers and discussions will appear in a subsequent number of the Journal.

ENTERIC FEVER IN INDIANS, WITH SPECIAL REFERENCE TO ITS OCCURRENCE IN THE INDIAN ARMY.

Captain R. A. Chambers, I.M.S., in a paper on Enteric in Indians, stated that it is now an accepted fact that enteric fever is a common enough disease amongst Indians. The disease is much rarer in the Indian Army than among European soldiers, but there is a marked increase in the prevalence of enteric fever amongst those classes of Indians for whom statistics are available, *viz.*, Indian troops and Indian prisoners.

The mortality amongst Indians appears to be higher than amongst Europeans either in tropical or in temperate climates, for amongst European troops in India the average mortality from 1894-1911 was 22 per cent., whereas, for natives of India, Rogers, in his Calcutta series of 50 cases, had a mortality of 26 per cent., and in my series of 68 cases the mortality was 23·5 per cent. Unless the relative immunity to the disease enjoyed by Indians be due to attacks during childhood (and the evidence in favour of such a supposition is conflicting and inconclusive), a low case mortality might be expected. From the fact that during the past four years the case mortality shows a distinct tendency towards decrease both for Indian troops and Indian prisoners, one is tempted to speculate whether the case mortality is not really much lower

than the available figures show, and that more accurate diagnosis, by the inclusion of the milder cases, is bringing us to a more correct estimate of it.

Captain Chambers' experience of enteric fever in Indians is based on 45 cases which were under his care in the Indian Troops Hospital in Quetta during a period of four years, and 23 cases under his colleagues.

Women and children are not treated in military hospitals for Indian troops. They are treated in their houses, and the absence of hospital facilities, for continuous observation and bacteriological diagnosis, probably accounts for the small numbers of women and children in statistics of the Indian army, rather than a lesser degree of prevalence.

Mortality.—Fifty-two recovered and sixteen died; a case mortality of 23·5 per cent. No case is included in the series which was not confirmed by one or more of the following methods:—

(1) The recovery of the specific bacillus from the blood.

(2) A positive serum reaction.

(3) The isolation of *B. typhosus* from the urine or fæces.

(4) *Post-mortem* examination.

Diagnosis.—(1) The method of blood-culture was employed in 42 cases; 4-5 c.c. of blood were obtained by vein puncture, and transferred to the culture medium, which consisted in 25 instances of sterile oxbile, and in 17 instances of 100 c.c. of a sterile 1 per cent. solution of taurocholate of soda in water. The latter method gave 16 positive results out of 17 examined, the former 10 out of 25. The earlier in the disease the culture method is used, the greater the proportion of positive results.

Seventy-seven per cent. of the cultures examined up to and including the sixth day were positive, and of those examined from the seventh day onwards only 37·5 per cent. were positive.

(2) The serum reaction was carried out in 45 cases. In 6 of these a positive blood-culture had been obtained.

(3) Isolation of *B. typhosus* from the fæces or urine. The bacillus was recovered from the fæces in 5 cases, and from the urine in 2 cases.

(4) A *post-mortem* examination was made in 3 of the fatal cases, and in each of them peritonitis due to a perforated typhoid ulcer was found. The intestinal lesions were characteristic. Two of these cases were definitely diagnosed *ante mortem*, but in one the cause of the peritonitis was only discovered at the *post-mortem*.

Symptoms.—(1) Onset and prodromal symptoms. The onset was sudden in 6 cases. Headache of a severe nature has been noted in several cases. Epistaxis has been noted in 13 cases only.

(2) The typical enteric appearance of apathy and low decubitis has been noted in a majority of the cases, as also the coated tongue, frequently with red edges.

Typical spots were observed only thrice.

(3) The pulse. A slow pulse in relation to the height of the temperature has been frequently noted.

Dicrotism, *during the first week*, especially when associated with a slow pulse, is in my opinion of diagnostic significance. Latterly, a slow dicrotic pulse with a high continued temperature has always excited my suspicion, and has been the indication of the necessity for an immediate bacteriological examination of the blood. The value of this sign was especially impressed on me in two cases admitted with signs of lobar pneumonia. Both had slow dicrotic pulses, which raised the suspicion of a typhoid origin. This suspicion was made a certainty by the recovery of *B. typhosus* from the blood in both cases. In the ordinary pneumonia a fast dicrotic pulse is the common state of affairs.

Pulmonary complications were of frequent occurrence. Bronchitis was noted in 19 cases, or 28 per cent., and primary pneumonia in 9 cases, or 13·2 per cent., giving a total of 41·2 per cent. for both conditions. The pneumonia was mainly broncho, but in 3 cases there was definite lobar consolidation.

Diarrhœa was present at some stages of the disease in 23 cases, or 36·5 per cent. In 40 the motions were normal or constipated. In 5 the condition was not recorded.

Abdominal symptoms are frequently absent. In 16, or 23·5 per cent., of the cases it is definitely recorded that there was neither pain, distension, nor tenderness at any stage of the illness. In 21 either pain, tenderness, or distension was noted. In 10 a negative abdomen was noted on admission only and no further observation made, and in the remainder the condition of the abdomen was not recorded. According to some observers (Ker, Davidson) the absence of the superficial abdominal reflexes is of diagnostic significance. In 23 cases of this series in which they were tested they were absent in only five.

The spleen was noted to be distinctly enlarged in 20 cases.

Presence of Malaria Parasites in the Blood.

In the early stages of enteric fever the true diagnosis is liable to be obscured, and more especially in those cases with the remittent type of pyrexia—which are not uncommon—by the finding of malaria parasites in the blood. If, in addition, the spleen is considerably enlarged and firm, it is a natural mistake to be satisfied with a diagnosis of simple malaria. But if these signs co-exist with a slow dicrotic pulse, and the pyrexia is not influenced by quinine, immediate resort should be made to bacteriological methods of diagnosis.

Of the 45 cases observed by Captain Chambers, 22 per cent. showed evidence of malarial infection. Kala-azar as a cause of splenic enlargement does not exist in Baluchistan. Lest it be thought that the presence of malaria parasites in the blood of enteric fever patients is an unimportant coincidence, it should be noted that in 5 of the above 10 cases the temperature curve was of the remittent type and not of the typical high continued type.

THE TEMPERATURE CURVE.

Duration.—The following table gives the data:—

	Under 15 days	15-21 days	22-33 days	Over 33 days
CASES				
Recovered	6	26	15	5
Died	8	2	5	1
Total	14	28	20	6
	20·6 per cent.	41·2 per cent.	29·4 per cent.	8·8 per cent.

The percentage of 8·8 (6 cases) non-fatal cases in which the pyrexia was under fifteen days' duration is deserving of note, as such cases are particularly liable to be overlooked. The percentage of 8·8 cases with fever lasting over thirty-three days should be compared with Rogers's percentage of 20 in Europeans in India, and also the total percentage of 61·8 of cases in which the duration of pyrexia was twenty-one days and under, should be compared with Rogers's 35·7 in Europeans in India. It is evident, therefore, that the average duration of the fever in Indians is much shorter than in Europeans in India, and corresponds more closely with the duration in Europeans in temperate climates.

The Type of Fever.—The classical step-like rise was well marked in 7 cases. It was much commoner, however, for cases to be admitted with a high temperature of 103° or 104° F., and for the chart not to show a gradual rise during the first week.

The Stage of Continued Fever.—Adopting Rogers's method of describing the types in this stage, high continued fever was present in the great majority of the cases, *i.e.*, a temperature keeping persistently above 101° F., and not varying over 2° F. for at least forty-eight hours.

Of the 68 cases 50 had high continued fever, 18 intermittent, remittent, or low continued fever.

Stage of Decline.—The temperature was frequently intermittent during this stage. It was prolonged in 6 cases only.

Stage of Convalescence.—In the great majority of cases the temperature reached the normal line by lysis, and did not again rise above this point. Relapses occurred in 4 cases only, and were of short duration.

Complications.—Perforation occurred in 4 cases. The diagnosis of perforation was confirmed in 3 cases by *post-mortem* examination, and in 1 case during operation. The case operated on died.

Hæmorrhage occurred in 5 cases. In 2 of them it was slight, and both recovered.

Thrombosis and phlebitis did not occur in any of the cases.

Captain Chambers's summary and conclusions are:—

(1) The mortality is higher than amongst Europeans either in tropical or temperate climates.

(2) The most valuable method of diagnosis is the early use of the method of blood-culture. It is most successful if carried out before the seventh day, and in my series the taurocholate of soda medium has given the largest proportion of positive results.

(3) A slow pulse, in relation to the degree of pyrexia, is of great diagnostic significance, and early dicrotism is of importance. Dr. Davidson, of the Travancore Church Mission, has applied sphygmometry in enteric for the confirmation of the low blood-pressure. To the trained finger dicrotism gives almost equally valuable information. I have never observed dicrotism in uncomplicated malaria, and in pneumonia, not of typhoid origin, the pulse, though almost invariably dicrotic, is generally 100 to 120 per minute.

(4) Malarial and typhoid infections may co-exist. The diagnosis may thus be obscured, and the temperature curve may be modified to an appearance of a malarial infection.

(5) High continued fever is the general rule, but other types are not uncommon, and in some instances are exceedingly atypical.

(6) Complications are exceptional.

BERIBERI.

PROFESSOR EIJKMAN opened the discussion on beriberi by a paper giving the history of his own investigations on beriberi and of those of observers in various parts of the world.

An illustration of this important paper will appear in the next issue of the Journal.

SOME RESULTS OF MEASURES TAKEN AGAINST BERIBERI IN BRITISH MALAYA.

DR. W. L. BRADDON, M.B., B.S., F.R.C.S.Eng., contends that the cause of beriberi is now known, and gave some details of the successful results of the practical application of that knowledge.

The first important evidence of the alimentary origin of beriberi was given by Van Leent in 1880, Takaki in 1885, and by E. Van Dieren in 1888.

Eijkman's discovery of polyneuritis of fowls in 1889, due to defect in their food (rice), has proved the foundation of modern, more precise knowledge of mode of causation of beriberi.

Further evidence of origin from food as a cause of beriberi has been given by Sakaki in 1892; by Braddon in 1893 and onwards; Grall, Vincent and Porée, 1895; Vorderman, 1897; Laurent and Brémaud, 1899; Grijns (confirming and extending Eijkman's work), 1900. From this date onwards many observations affording positive evidence of defect in food, particularly in rice, as the cause has been contributed by Haynes, Anderson, Saneyoshi, Littlefield, Uchermann, Pétit, Hulshof and Pol.

None of these observations are, however, convincing. The first complete epidemiological proof that beriberi (among native rice-eaters) depended solely on the kind or condition of the rice eaten was furnished by Dr. Braddon in 1904 and 1907.

The general evidence then given has been confirmed later by special experiments, such as those of Fletcher in 1907; and the experiment with free coolies in Jelebu, conducted by Braddon, Fraser

and Stanton, wrongly published by the latter two as their work alone.

The proximate cause has been defined by this evidence with certainty, and by the efforts of later investigators directed to isolation from foodstuffs of protective principles, the absence of which caused beriberi, according to the observations of Schaumann, Aron, Chamberlain, Simpson and Edie, Cooper, Funk, Hopkins, Moore, &c.

The Theory in Practice.—Epidemiologically, and speaking broadly, among rice-eating natives beriberi is due to nothing more or less than the use of rice which has been deprived of most of its surface-layer of cells containing aleurone—which has in fact become "deglutenized," and the application of this principle by Dr. Braddon's efforts wholly bears out the idea.

In Prevention of Beriberi.

(1) In the Singapore Prison beriberi constantly prevailed (with a single interval) since 1869. The disease was abolished for good and all in 1904 simply by substitution of whole ("cured," or "unpolished") rice for the white ("uncured," or "unpolished") sort formerly in use.

(2) In the prisoners of the Federated Malay States he obtained the same result.

(3) In the Singapore lunatic asylum beriberi prevailed from its foundation in 1889, attacking three-quarters of the inmates, and caused the death of 30 per 1,000 annually. This continued, until in 1905 the writer's proposal was adopted, *viz.*, the substitution of whole for white rice. On this the disease wholly disappeared.

(4) The Selangor lunatic asylum—an even worse record. Here the attack-rate was over 150 per cent., and death-rate from beriberi at times 50 per cent. On the adoption of whole rice the disease at once disappeared.

Fletcher's experiment, designed to overthrow the writer's "rice-theory," carried out in this asylum, afforded a triumphant indication of the truth of the theory.

In Reduction of Case-mortality from Beriberi in Hospitals—Instances.

(1) *Tan Tock Seng's Hospital, Singapore.*—An average of about 1,000 admissions for beriberi annually, death-rate often over 50 per cent. Immediate reduction on adopting whole rice; from 48 per cent. to 17½ per cent. Now 10 per cent.

(2) *Durian Daun Hospital, Malacca.*—About 500 cases annually. Average death-rate formerly 30 per cent.; whole rice reduced it to 9·2 per cent.

(3) *Jasin Hospital, Malacca.*—Average 113 cases, average mortality 24 per cent. In year of adoption of whole rice mortality 41 per cent. Immediate reduction to 9·2 per cent.

(4) *Batu Gajah Hospital, Perak.*—Average admissions 450, mortality between 21 and 65 per cent. Immediate reduction on adoption of whole rice from 60 to 16 per cent.

(5) *Kampar Hospital, Perak.*—Average admissions 856. Mortality 46 per cent. previous year reduced to 16 per cent. in year whole rice adopted.

(6) *Christmas Island Hospital.*—Average 850 cases admitted. Mortality reduced from 10 per cent. before to 2 per cent. after the introduction of the whole rice.

In thirteen principal hospitals of Malay admitting some 3,500 cases of beriberi annually and having the worst mortality, the death-rate has been brought down from an average of over 30 per cent. to under 15 per cent., in other words, a saving of at least 500 lives effected annually.

In every hospital whole rice has now been adopted with in every case the same marked results.

A comparison of the Straits Settlements as a whole with the separate Native States is made, and results of equal significance noted. In Negri Sembilan, which has not employed white rice in the patients' dietary for the last thirteen years, the case-mortality has not once reached 10 per cent. during that period, and generally under 5 per cent.

Some 10,000 cases in all are treated in the Straits Settlements and Federated Malay States annually. The reduction in mortality from a former general average of over 30 per cent. to a present one of about 10 per cent. means the saving each year of 2,000 lives—the first harvest of the practical application of the "rice-theory."

The following resolutions are proposed by the writer:—

(1) It is recognized by the Congress that among natives whose food-staple is rice, beriberi is produced by the continued consumption of the grain in the form of "white" rice, or rice which has been deglutinized or altered by the removal of essential principles in milling.

(2) Rice in this condition is unfit for use as a food-staple, and must be in this respect described as a noxious article injurious to health.

(3) This section urges upon all authorities responsible for the health of native communities the propriety of restricting or preventing the sale and use as a foodstuff of rice which has been thus altered.

(4) In view of the now proved non-infectiousness of beriberi this section recommends to all port and sanitary authorities the propriety of abolishing quarantine and other restrictive measures at present operative against the disease.

THE PRESENT STATE OF THE STUDY OF BERIBERI IN JAPAN.

Dr. S. Shibayama, Tokyo, stated that the commission for the study of the cause and prevention of beriberi, formed in 1908 in consequence of the fierce epidemic which broke out in the Japanese army during the late war, deemed it necessary to determine what relations exist between the two allied diseases kakké and beriberi, came to the conclusion that they are identical. Since then the commission

has issued various reports, which may be classed as follows: (1) Experimental study of the beriberi-like disease in birds; (2) prevention of beriberi with cured rice or a mixed diet consisting of rice and barley; (3) epidemiological observations.

Experimental Study of the Beriberi-like Disease in Birds.

(1) Fowls, especially hens, pigeons, &c., die of a beriberi-like disease when they are fed with "white" rice, *i.e.*, rice the bran of which is separated by pounding, so that it presents a semi-transparent colour, but the administration by the mouth or subcutaneous injection of rice-bran or its derivatives, *e.g.*, alcoholic extracts, will cure them.

(2) As to the cause of the beriberi-like disease in birds that is contracted by feeding on white rice, the Japanese workers disagree with Schaumann and Fraser, who advocate the phosphorus starvation theory. Though the insufficient phosophoric contents of white rice may cause kindred symptoms in animals, the true cause is held to be other than phosphorus itself. Dr. Suzuki, chemist, attributes the disease to the lack of a material called "aberic acid," which he removed from rice-bran by a complicated method; for even a small dose of this acid, *i.e.*, 0·005 mg. daily, will protect a 300 gr. pigeon fed with white rice from contracting the disease.

(3) Others hold the zymotic hypothesis. They attribute the disease to a toxin produced by the fermentation of white rice, and not to the deficiency of a certain kind of nutriment. This hypothesis is based upon the results of an experiment in which fowls contracted a beriberi-like disease, similar to that caused by feeding on white rice, from an injection of a fermentative product of white rice; they were led to this by the fact that the heart of a frog will stop in diastole if it is immersed in a fermentative product of rice produced by a certain kind of enzyme, just as it will in the milk of a beriberic woman.

(4) Our Japanese experimenters may be divided into two schools. One considers the beriberi-like disease in birds caused by feeding on white rice to be identical with human beriberi, while the other thinks these two diseases are quite independent.

One school points to the fact that clinically the beriberi-like disease in birds resembles closely that met with in human cases. The other (the majority) disagrees with the first on the ground that, although bird-beriberi may present similar symptoms and anatomical findings to a certain degree, it does not always do so. The curative effect of rice-bran and its derivatives upon bird-beriberi seems to afford the most interesting analogy to human beriberi, for it would serve to a large extent to establish the identity of the two diseases; but many experimenters consider that these substances do not cure human beriberi, or at most, they do not think that they have brought about such a marked improvement in the human as in the birds' disease.

If we admit the conclusion reached by the latter school, we see that the study of the beriberi-like disease in birds has but little to do with the discovery of the causative agency of human beriberi.

Experimental Study of the Preventive Efficacy of Cured Rice and a Mixed Diet, consisting of Rice and Barley, upon Human Beriberi.

Experiments to determine these points were carried out in coal mines where the miners had been yearly affected most severely and in a fishing village where the inhabitants had also suffered severely. In both places the inhabitants were divided into groups consisting of a certain number of persons (usually 100); during the beriberi season seven months from the beginning of April to the end of October) one group was provided with cured rice, another with the mixed diet consisting of rice and barley, while a third was given white rice as control, the object being to determine which group provided the largest number of patients. It was possible to make the main diet uniform, but unfortunately not the side dishes. The experiment was carried out twice in each place, and showed that neither the cured rice nor the mixed diet of rice and barley is able absolutely to prevent the disease, though they seem to play some part.

Epidemiological Observations in Beriberi.

In Japan every year beriberi appears sporadically like typhoid fever. However, particularly in villages or on board ship, a severe outbreak often takes place. Coal-miners, fishermen, railway labourers, and prisoners are the classes among which the epidemic rages.

The causative relation which is supposed to exist between rice and beriberi has been studied most carefully in many epidemics. Most of these prevailed among people who ate rice, but some raged among those who took a mixed diet consisting of four parts of rice and six parts of barley. From the facts that have been given in the previous paragraphs, some arrive at the conclusion that rice is perhaps the cause of beriberi, but they cannot deny the fact that all the labourers who eat rice and live in the same surroundings do not contract the disease. This seasonal prevalence is noticed in almost all epidemiological observations of the disease.

Résumé.

Those who are studying beriberi in Japan have not yet been able to arrive at any conclusion. Rice as well as a monotonous and one-sided diet may give rise to the onset of the symptoms, but they cannot be assumed to constitute the cause of the disease. The symptoms and anatomical changes seem to develop from intoxication by a poison which is produced by a certain kind of micro-organism in the human body, especially the intestine. This hypothesis may explain the geographical and seasonal prevalence, for if the disease were caused exclusively by deficiency of a certain kind of nutriment, we do not see why it should not occur among other nations as well as the Far Eastern.

Discussion.

Professor Dr. B. Nocht, Hamburg, said: I fully agree with the excellent historical and critical *résumé* of Professor Eijkman on the actual standing of the beriberi experiments. Therefore, my remarks are not really necessary, but as one will expect to hear my opinion on the matter, I will add the following:—

I quite agree that Professor Eijkman deserves the first honours in this latest step in our knowledge of the etiology of beriberi. His first experiments on animals, and the experiments carried out by him and Vordermann in Java on the feeding of beriberi patients, form the starting-point of all further researches. I am not going to explain how the idea arose that Eijkman in the first place wished his animal and human beriberi to be explained by poison formation and effect. It is sufficient for me to-day to note that Professor Eijkman has personally stated that he proposed this poison theory only to deny it later on.

Grijns was the first man who suggested to me with the greatest assurance that beriberi was due to the lack of certain unknown material in the foodstuffs, *i.e.*, that it is due to a kind of partial hunger. I would like to note with modesty that I, without knowing of Grijn's opinions, was the first to order systematic experiments to be made in my institute in the search for these lacking substances which I had suspected. These experiments have been carried out by Herr Schaumann, and have led to the formulation of his theory of lack of phosphorus. This theory has found many opponents, and Schaumann himself has modified it. At any rate, Schaumann deserves to be recognized as the first to have found determinate groups of elements which come in the consideration of the etiology of beriberi. One may differ from his conclusions, but at any rate the phosphorus question is by no means worked out, and further experiments are necessary to show whether phosphorus free foods, which, according to Funk, are now called "Vitamine," are not perhaps strictly connected in nature with phosphorus containing substances, and also whether the exchange of phosphorus containing food is not of the greatest importance, at least in certain forms of experimental beriberi in animals as well as in man. This we must leave to the physiological chemists. The clinicians as well as the practical hygienists must for the present confine themselves to the fact that phosphorus is the standard by which they must judge the prophylaxis and the question of a systematic diet. Further, we must accept as a fact that there is a surplus of vitamine, whether phosphorus free or phosphorus containing. In 1909 in my note on the beriberi question, given before the German Society of Tropical Medicine, I expressed the opinion that we must accept the fact that the different forms of beriberi are due to the lack of certain substances, x, y, z, &c. At that time I explained that Schaumann had discovered the traces of one of these "x's," and I state that even Funk's vitamine represents only an "x" in the mass of lacking material. Vedder and Clark are also of this opinion. Naturally, these substances need not be unknown to us; it is sufficient to prove the importance of the food exchange. Naturally, it is not excluded that the effect is only indirect and more complicated than we at first thought.

This last work induces me to say a few words on the pathological anatomy of beriberi. Vedder's and Clark's observations coincide with mine. A general degeneration of the nervous system takes place, especially in the central organs, similar to that observed in certain infectious diseases. I point this out specially, as we should always speak of the alimentary nerve degeneration in birds and other experimental animals and in man, and should no longer speak of polyneuritis. I should also like to speak of the *rôle* of infective influences in beriberi, and of the local and seasonal relation to the disease. It is known that change of weather and fatigue play an important part in the outbreak of beriberi; the same may be said of wounds and accidents. We are also told that intestinal catarrh, which may often be of infectious origin, very often is an incipient symptom of the disease.

It has been determined by Rumpf and Luce that often in mild cases of beriberi advanced nervous degeneration may be observed, so much so that one must expect them to have existed long before the first clinical signs of the disease appear. Vedder and Clark have observed the same characteristics in fowl. It may be compared with alcoholic nerve degeneration. To these occasional predisposing causes must be added also infectious influences. That explains how intestinal catarrh may be a cause of a sudden outbreak of beriberi.

In my opinion the therapeutical use of rice-bran, yeast, and similar stuffs have been of no use whatever, and I think that is also the conclusion come to by Isuzuki, although this observer fully believes in his "Antiberiberin."

It is interesting to note that the mild and early cases, such as the so-called sailing-ship beriberi, improve very rapidly by supplementing tinned food for fresh food without any further special therapeutic preparations being employed, whilst the advanced deformed cases heal very slowly. In our therapeutical experiments at Hamburg Institute we have had the same results with fresh food as when we added rice-bran, &c.

We have no certain results with parenteral applications. On the contrary, we have had complaints. We have, however, dealt with no case of fulminant heart insufficiency. In such cases the parenteral application with extracts might be successful. Therapeutically, and according to animal experiments, we would expect in these cases life-saving results. At any rate, I believe, until I hear of anything better, that raw foodstuffs are more reliable, and can be used therapeutically in a greater number of cases than the chemically prepared, sterilized and isolated vitamine, because a single such vitamine represents, in my opinion, only one of the factors, whilst we need a mixture of several vitamines, viz., such as we find in raw food and in the first extracts from raw food. At present, however, we are not able to artificially prepare these different mixtures of vitamine.

ULCERATED AND SWOLLEN GUMS IN INDIAN TROOPS.

Colonel P. Hehir, I.M.S., Assistant-Director of Medical Services, Burma Division, called attention to the prevalence of a condition of ulceration, sponginess, and swelling of the gums met with in Indian troops; it is frequently associated with some denudation of the epithelium of the tongue, small ulcers, and a greater or less degree of oral sepsis. One sees some cases of it in almost every Indian battalion one inspects, and that at all periods of the year. The pathological state appears to be one of ulceration with suppuration of the margins and inner surfaces of the gums, so that, for want of a better name, one has called it suppurative gingivitis. Its chief incidence is during the hottest summer and early autumn months, when men have run down from the effects of the hot weather, or possibly from an inadequate supply of fresh vegetables which occurs at that time of the year. It is specially common during our Indian Frontier Campaigns, particularly campaigns lasting over three or four months. At the end of the Tirah Expedition of 1897-8 some regiments had as many as 40 per cent. of men afflicted with it. The condition occurs also in the civil population at the seasons mentioned, especially during periods of drought and scarcity. It is not associated with dental caries. Our European troops are not affected by the malady. The condition is painless, and, as a rule, the men do not know anything about having it. At first sight it has the appearance of pyorrhœa alveolaris, and one has known at least half a dozen military medical officers diagnose it as such. But unlike that very chronic and somewhat formidable malady, it is curable in a fortnight or so with local applications, such as tincture of iodine, and antiseptic mouth washes, without any loss of teeth. In a Gurkha battalion inspected in September, 1911, one found 130 cases of it in a severe form, and more than half the regiment with it in a mild form. In this instance it took several months' treatment to eradicate the malady entirely from the battalion.

In some cases the gums are so swollen that the teeth appear to be almost buried in them. In such cases the gums are congested and bleed readily on pressure. In others the margins of the gums have atrophied, receded, and exposed the whole of the crowns and part of the fangs of the teeth, and present a thin ulcerating margin. Generally a large area of the gums of both upper and lower jaws is involved, thus contrasting with pyorrhœa alveolaris, in which, except in the advanced stage, the disease is localized to the gum opposite one tooth or a few teeth. Sometimes the atrophy of the gums will be found associated with the accumulation of masses of dirty greyish or cream-coloured tartar on the outer aspect of the teeth, rarely on the inner surface also. Such masses may at times also be found beneath swollen gums. On scaling off these masses of tartar we expose an ulcerating gum which may be very offensive. In these tartar cases the cleaning of the teeth has been neglected, because the patients have found the ordinary process of using the frayed end of a stick as a tooth-brush painful. These blocks of tartar are unlike the small greenish patches of cretaceous material found beneath the pockets of the gums in some cases of pyorrhœa alveolaris. In a small percentage of cases the gums are tender, which renders mastication difficult and painful. These are the only cases that seek treatment of their own accord. There is often slight foulness of the breath, exceptionally a very offensive odour is given off, due probably to the presence of micro-organisms which generate indol in the disease area. In all cases a small quantity of mixed creamy pus and mucus exudes between the gingival border and the teeth when the gum is pressed with the finger. The condition itself, if not grossly neglected for a long time and masses of tartar have not formed, does not appear to endanger the integrity of the dental structures.

Signs of infection of the alimentary canal, such as "catarrhal dysentery" or diarrhœa, are common in men with affected gums.

The chief micro-organisms one has found in stained smears made from the pus have been streptococci and staphylococci, and the ordinary flora inhabiting the mouth; in several cases one has seen an amœba very similar in morphological characters to *Entamœba coli* in association with one or other kind of the bacterial forms named; this amœboid organism was never found to be anything like *E. histolytica;* in three cases a short, plump, Gram-staining bacillus was seen.

The condition is similar in some respects to that often seen in the incipient stage of land scurvy met with in the civil population of the poorer classes in India; rarely it is associated with more positive and general manifestations of the scorbutic taint, such as anæmia, extravasations into the muscles, rheumatic-like pains in the joints, dysenteric symptoms, &c. Like scurvy, in the large majority of the more severe cases it yields to anti-scorbutic treatment and oral antiseptics. It seems in India and in Indian frontier warfare to precede for some time the appearance of the actual signs of developed scorbutus. It was very prevalent in Somaliland in 1903-4 before the outbreak of actual scurvy, and it there, as in India, predisposed to bacillary dysentery.

It is, as previously stated, remediable. Its prevalence in an Indian battalion indicates that there is something defective in the feeding of the men. The periodical examination of the gums of Indian troops is important, and should be made at all medical inspections of these troops as to their state of health.

Colonel Hehir had no theory to advance regarding the intrinsic nature of this diseased condition of the gums, and with reference to its etiology the only fact one can bring forward is its association with a defective dietary. During the last six years one has met with over 2,000 cases in thirteen Indian infantry battalions inspected.

THE PROBABLE IDENTITY OF PELLAGRA AND SPRUE.

Dr. Charles E. Stewart, Battle Creek, Mich., U.S.A., drew attention to many points of similarity between pellagra and sprue. He considers that sprue and pellagra are so much alike that we are justified in concluding that there is a very strong possibility of their having a common etiology. This conviction has been further strengthened by the fact that the diet which gives the best results in cases of sprue, *viz.*, milk and strawberries, in his hands, also gives equally good results in cases of pellagra.

In the differential diagnosis of pellagra and sprue there is only one symptom which calls for serious consideration, namely, the cutaneous lesions which are so frequently found in cases of pellagra, and from which the disease receives its name. From a study of the literature and from personal observations of these two diseases, it is apparent that cutaneous lesions are quite common, and more or less characteristic in cases of pellagra, while in cases of sprue, characteristic cutaneous lesions have not been observed. Nevertheless, some of our best pellagrologers describe cases of *pellagra-sine-pellagra*, and in 2 cases of sprue, one from Porto Rico, the other from Central America, there are skin lesions. In both, the dorsum of the hands was of a dark red colour, rough and parchment-like; in one there were recurring ecchymotic areas such as Hyde described as occurring in cases of pellagra.

Dr. Charles Begg states that the loss of subcutaneous fat results in visible changes in the skin and hair; the skin becomes dry and rough, and the hair loses its lustre, and may become brittle and fall out.

Authorities on pellagra are by no means unanimous in their opinion that pellagra is always accompanied by cutaneous lesions. Marie has observed that there are pellagrins in whom there are no disorders of the skin or of the digestive organs, and who suffer most from general debility and motor disturbances, such as vertigo.

Cipriani noted local differences in the symptoms of pellagra, where the cases were slow and intermittent in their course, and rarely accompanied by erythema.

Wood, in his recent work on pellagra, writes as follows: "We have been told that in the London School of Tropical Medicine the students are taught to diagnose pellagra without the presence of skin manifestations. Certainly such teaching would be unwise in the southern states, if for no other reason than because of the fact that in this region there also occur sprue, Cochin-China diarrhœa, and amœbic dysentery. Sprue especially complicates the question, for the reason that its symptoms, except for the absence of skin manifestations, are almost identical with pellagra. After a careful study of the two diseases, one is unable to distinguish so-called '*pellagra-sine-pellagra*' from sprue." He is of the opinion that it is highly improbable that *pellagra-sine-pellagra* exists, and that a description of this form owes its existence to the fact that there are cases of pellagra in which the skin manifestations are at times so insignificant as not to attract attention even from the patient. He has also observed that the insignificance of the skin lesions does not necessarily indicate a mild form of the disease; on the contrary, many of the most severe and fatal cases of pellagra are accompanied by very slight, almost inconspicuous cutaneous lesions. On the other hand, cases with extensive cutaneous lesions often run a comparatively mild course, and in some instances end in recovery. The mildest case, and the one which made the most satisfactory progress in my series, was a man of 70, who had *pellagra universalis*.

Bad food, unsanitary conditions, debilitating diseases, diarrhœas, pregnancy, uterine disorders, ankylostomiasis, and amœbiasis have all been given by various observers as predisposing factors in the production of both pellagra and sprue. Both are diseases principally of adult life; no age, however, is exempt, most cases occurring between 20 and 50; as age advances the prognosis becoming more grave.

A study of the literature shows that both pellagra and sprue have been thought by some to resemble scurvy. Cantlie, in referring to sprue, suggests that it may have some relation to scurvy, and Manson, in referring to pellagra, states that "the gums may be swollen and bleed easily, a condition which gave rise to the name 'Alpine scurvy.'"

In referring to the most prominent symptoms of the two diseases under consideration, we believe we are justified in giving first place to those referable to the gastro-intestinal tract; in fact, as far as the patients are concerned, these symptoms are so pronounced that they, in most instances, adumbrate all others.

Wood, in referring to the gastro-intestinal symptoms, says that the first indications of pellagra are found almost invariably in the gastro-intestinal tract, and that pellagra without an impression on the digestive apparatus has never occurred in his experience. He further states that it would be very questionable in his mind if a diagnosis without these manifestations would be justified. In an experience with 400 cases he has never seen a single case of this kind.

Of the gastro-intestinal disturbances in both pellagra and sprue, probably the most unvarying in the constancy of its presence is the stomatitis. In referring to this in connection with pellagra, Wood states that "when we know more of the so-called '*pellagra-sine-pellagra*' it is possible that the stomatitis may be shown to be a more constant symptom than the erythema. At the present time it should be placed second in the list of symptoms."

Dr. Stewart would assign to the gastro-intestinal symptoms in pellagra the first place, and consider the cutaneous lesions as secondary, as we now so frequently do in a number of other so-called skin diseases which have their origin in the gastro-intestinal tract.

The stomatitis in pellagra and sprue is almost identical. In both there are dysphagia, salivation,

varying degrees of ulceration, denudation of epithelium, marked erythema of the buccal and pharyngeal mucosa, smarting and burning of the mouth and œsophagus. So similar are these lesions that Wood makes the following statement concerning them: "The tongue condition, together with the intestinal symptoms in pellagra, has given rise in some sections of the south to the idea that sprue is prevalent in that region. It is very probable that sprue does occur, and this is one of the best reasons for hesitation in acknowledging the possibility of '*pellagra-sine-pellagra*,' for the symptoms of sprue are almost identically those of pellagra without skin manifestations." He further states that "it is not only in regard to the mouth symptoms that sprue must be considered in connection with pellagra; there are many points of resemblance in all the alimentary manifestations of the two conditions." For himself he can find no satisfactory points of distinction between sprue and pellagra without skin manifestations.

The character of the stools in both of these diseases is strikingly similar. The macroscopic appearance of the stools in both diseases is almost identical. In both the stools were light coloured, characteristically frothy, acid in reaction, and contained an abnormally large amount of fat and fatty acids. A bacteriological examination revealed the presence of large numbers of putrefactive bacteria in every instance.

Wood, in referring to the diarrhœal features of these two diseases, writes as follows: "There are many things about the diarrhœa of pellagra which suggest the diarrhœa of sprue. The dysenteric symptoms seen in the early stages of pellagra gradually give way to the serous diarrhœa. This same thing occurs in sprue." Amœbæ have been found in large numbers in the stools of both pellagra and sprue cases. In fact, so similar are the stools in these two diseases that without further knowledge concerning them we should be justified in suspecting a common cause.

Indicanuria seems universal in both pellagra and sprue.

The nervous and mental symptoms present in some cases of pellagra have, we believe, been given undue prominence, and have sometimes led to an erroneous classification of the disease as of nervous origin. While symptoms referable to the nervous system are quite common in cases of pellagra, they are by no means constant or characteristic. The nervous manifestations in pellagra are probably the result of profound malnutrition and intestinal toxæmia.

In studying the pathological anatomy of these two diseases, we are again confronted with a striking similarity.

Tuczek has found in pellagra an attenuation of the intestinal wall as a result of atrophy of the muscular coat, with occasional hyperæmia and ulceration of the lower parts of the canal.

In sprue the mucosa is almost entirely destroyed, being replaced by a structureless substance containing leucocytes; the submucosa appears much thickened, fibrous tissue being abundant. The muscular layer is thinned.

Both pellagra and sprue are considered as afebrile disorders. It is a fact that there are periods in both in which there may be an increase in the temperature; they are in the main, however, afebrile.

In August, 1911, Dr. Burnett, of Edinburgh, called attention to some of the principal features which are so similar in these two diseases, and concluded his article with the following statement: "So convinced am I that the two diseases are one and the same that I feel that I am in duty bound to put my opinion on record in order that it may be confirmed or refuted by those who have had more experience with these diseases."

With the possible exception of the cutaneous lesions which occur in pellagra, the symptomatology and pathology of the diseases under consideration are so nearly alike that a careful consideration of them does not offer sufficient grounds for a positive differential diagnosis.

The gastro-intestinal symptoms, which are the most prominent in both instances, are strikingly alike, and the results obtained from examinations of the gastric contents, stools, blood, and urine, reveal almost identical conditions.

SANITARY ORGANIZATION IN THE TROPICS.

Sir Ronald Ross, K.C.B., F.R.S., D.Sc., D.P.H., Professor of Tropical Sanitation, University of Liverpool, said he used the word *sanitation* in its widest possible sense, to include everything which tends to reduce the sickness and mortality of human beings.

The effective prevention and treatment of diseases implies, above all things, an effective administrative machinery. Our proper subject to-day is therefore concerned with the question as to the best form of machinery which is to be employed in tropical countries.

Sanitarians are not concerned with most of the questions which politicians like to consider in connection with their theories of ideal government. Whether a country is governed by a despot, or by an oligarchy, or by a democracy, does not always appear to them a matter of vital moment. The point before sanitarians is how administration can best be directed towards the mitigation of disease.

(1) *Unification of the Sanitary Services.*—Should the entire sanitary service be unified, or may it be split up into different independent departments? The possible departments into which it may be divided are: (1) The Medical Department, concerned with the treatment of disease; (2) the Sanitary Department, concerned with its prevention; (3) the Research Department; (4) the Statistical Department; (5) the Engineering Department; (6) Subsidiary Departments. The first question is whether it is advisable, in an ideal state, to place all these under one head. I may point out that in most tropical countries they are at present placed frequently under almost independent heads. Even

the medical and the sanitary departments are often practically separate; while sanitary engineering, especially as concerned with large water supplies and sewerage schemes, is often divorced entirely from the sanitary department—which, indeed, is not even consulted regarding such matters. Similarly, researches, where they are subsidized at all by the government, are often practically independent both of the medical and of the sanitary branches. Again, the sanitation of municipalities is generally left entirely to local bodies, which are apt to resent even the nominal suzerainty said to be exercised over them by the national or colonial government.

The whole sanitary services of a country should be unified, and the separation of the various sub-branches makes only for imperfect administration, overlapping, and waste of money.

(2) *Representation on the Supreme Governing Body.*—The health of a community is of sufficient importance to require a separate Department of State. In my own opinion the subject is as important as those of Education, the Church, the Law, Trade, the Treasury, the Army, and the Navy. There is no reason, for example, why the medical and sanitary department should be placed under the education department, as is done in India; nor why it should be subordinated to various other departments, as is done in this country. We have already maintained that there should be a ministry of public health in large states, or its equivalent in smaller states and colonies.

(3) *Should the Sanitary Service be Subordinated to the Medical Service or vice versa?*—The present custom in British possessions is that the sanitary service is always subordinate to the medical service. The Americans, however, have introduced a new precedent in the Panama Canal zone, where the Chief Sanitary Officer is the head of both the services and, indeed, of other branches of administration. Personally I think that the American plan is the better one. The purely medical branch properly falls into its place as one, and only one, of the branches of the general sanitary service; and I therefore think, personally, that it should be subordinated to the latter, and not vice versa. Perhaps the best way out of the difficulty is to call the head of the combined department the Director of Sanitary and Medical Services, without subordinating one to the other.

(4) *The Position of Sanitary Engineering.*—At present the head of the medical service sometimes has a sanitary engineer under him, as in Mauritius; but this is very exceptional; and if the sanitary service requires any sanitary engineering done, it must appeal by a roundabout way to the Public Works Department, which may or may not adopt its ideas. Now, effective sanitation is always requiring small engineering works of one kind or another, and this procedure leads not only to unnecessary delay, but to frequent waste of funds. Naturally the whole subjects of water supply, sewerage, surface drainage, housing of the poor, and a large part of town planning should come into the sanitary service; but, owing to the frequent neglect of this obvious rule, much waste of money now often occurs. Every sanitarian is acquainted with many instances in which water supply and sewerage have been undertaken, at an immense cost, without proper previous appeal to the sanitary authorities. I admit that the question is a difficult one. It means either that the engineers should be subordinated to the doctors, or that the doctors should be subordinated to the engineers, or that both should be independent. As a matter of fact, however, where there is a proper ministry of public health, both will be subordinate to the head of that ministry, and the difficulty would adjust itself automatically. This merely gives another argument for the construction of such a ministry or of its equivalent in colonies. At all events, if the larger engineering works, such as water supply and sewerage, be kept distinct from the sanitary service, the latter should always have a sanitary engineer for the smaller works which it so frequently requires.

(5) *The Position of Research.*—Where medical investigations are carried out under public funds, they are now merely nominally placed under the head of the sanitary or medical departments. In my opinion, they should be closely incorporated with the latter.

(6) *The Statistical Department.*—This should include not only all vital statistics, but sanitary and medical records. At present, no colony that I know of, except India, perhaps, possesses an adequate statistical department. Apparently any one is good enough to collect statistics. As a matter of fact, the subject is an extremely difficult one, and requires expert mathematical knowledge.

(7) *The Sanitation of Municipalities.*—This is a burning question everywhere. At present, even small municipalities seem to possess almost unlimited powers over the lives of the people living under their rule. However inefficient they may be the Government of the State is generally unwilling to interfere with them, on the absurd ground that they should not interfere with liberty. But we must draw a careful distinction. Public sanitation requires highly expert knowledge, highly organized effort, and sufficient funds. Now, these may be forthcoming in a very large city, such as the great cities of Britain, which can afford to pay for proper health officers and the other necessary experts, but it is unlikely that they can exist in many of the small towns in the Tropics, which have, unfortunately, been given municipalities before they were ready for them. Is it likely that a small town of under one hundred thousand inhabitants, consisting mostly of natives or half-castes, can ever pay for sufficiently expert sanitary advisers? We are all familiar with such municipalities. They appear to be free to entrust their sanitation to anyone, skilled or unskilled—a local doctor, a local engineer, or a local health committee consisting of shopkeepers, builders, lawyers, and others. As a rule, they neglect their sanitary duties for the sake of local politics, and then raise an outcry when the superior government call them to account. The whole subject requires careful looking into, at least, with regard to British possessions,

All the sanitary work of the smaller municipalities and town councils should be subjected to the scrutiny and discipline of superior governments, which should not hesitate to take action on the smallest provocation. The slums, which are such a blot upon British town administration, really arise from the defects referred to under this heading. Popular government deserves to exist only where it is efficient. Where it is inefficient, as in many countries which I have personally studied, it should be either abolished temporarily or forced into better ways. Under present conditions, the lives of thousands of people are endangered or lost owing to our worship of a fetish.

(8) *The Management of Epidemics.*—Effective sanitary services should have a proper department for dealing with epidemics—which, at present, they scarcely ever possess. Whenever an epidemic threatens, or exists, the head of the sanitary service should be able immediately to send expert officers to the locality in order to investigate, to organize, and, in case of emergency, to direct the defensive measures.

(9) *Sufficiency of the Local Forces.*—There are some points which still remain to be referred to. One is the frequent insufficiency of the local sanitary force of inspectors, sweepers, scavengers, mosquito-brigade men, and so on. In many British possessions, hardly any effort is made to provide sanitary workmen for the villages or even for the smaller towns. We seem to think that the only way to improve the sanitation of a country is to educate the people—that is, to force the people themselves to clean up their own backyards, and to remove their own mosquitoes, &c. This is a false view. The people cannot do this work even if they wish. It is a work which must be done by the local authorities, and by means of a sufficient body of labourers. Sanitary commissioners, health officers, sanitary engineers, and sanitary inspectors by themselves are almost powerless. They must possess a proper working force under them.

(10) *Provincial Delegation of Sanitary Authority.*—In a large country or colony the head of the sanitary service must delegate many of his duties to subordinate provincial staffs, but decentralization should only be partial—just as it is in military affairs. Sanitation is a kind of war, requiring both local effort and central direction from above. It is a mistake to give unlimited power to local sanitary departments, as is often done.

(11) *Committee-Government.*—One other point remains to be considered, namely, the efficiency of committee-government. In my experience, committees are not of much use in connection with sanitary matters. Most of the time of the executive officials is taken up in trying to persuade ignorant members of the committee to adopt certain lines of action, the utility of which would be obvious to persons who know the business. Committees cannot reason as quickly and as comprehensively as individuals can, but, on the other hand, they are sometimes more impartial, and may even occasionally add information which the individual does not possess. On the whole, perhaps, the best rule is that of very small executive committees, consisting of a few *paid* individuals, who are severally and jointly responsible to a higher authority.

COLONEL P. HEHIR, M.D., F.R.C.P.Edin., I.M.S., said that the question as to what is the best form of sanitary organization for armies in the Tropics is a subject upon which the opinions of even experienced military sanitarians are likely to differ, but the sanitary organization of our army in India at the present day is the most comprehensive and practical, and, as the results show, the most efficient in existence in the Tropics, and may be presented as a model.

The progressive improvement in the health and the reduction of mortality in our European and Indian troops in India during the last thirty odd years are shown in the following table:—

Year	British troops Per 1,000 of strength		Indian troops Per 1,000 of strength	
	Constantly sick	Death-rate	Constantly sick	Death-rate
1880	74	24·85	56	39·22
1902	66	14·68	24·6	11·16
1905	52·3	10·05	23·2	8·09
1907	46·4	8·18	21·7	6·27
1909	40·3	6·25	20·8	5·62
1910	31·93	4·66	21·1	4·89
1911	28·81	4·89	19·8	4·48

The improvement in health is brought out even more conspicuously if we consider the change in incidence which has taken place in the three infective diseases, cholera, enteric fever and bacillary dysentery. Amongst our European troops in 1860 there were over 1,500 admissions and nearly 1,000 deaths from cholera. In 1867 it caused 529 deaths. In 1869 the European army in India lost from cholera alone over four times the number of men it lost in 1911 from all causes put together; in the same year one battalion of European infantry lost one-third its total strength from this disease. A generation ago we had cholera every year at certain seasons in a large number of military cantonments, mostly in the form of explosive epidemics due to specific contamination of water-supplies. In the years 1910 and 1911 the death-rate from cholera in both European and Indian troops was only about 1 per 10,000. Corresponding reductions in the incidence of enteric fever and bacillary dysentery could be quoted. The lessened prevalence of, and mortality from, cholera and bacillary dysentery are equally remarkable in our Indian troops during the period mentioned.

In the early period of our occupation in India the death-rate amongst our European troops was 80 per 1,000 per annum. This has been so altered by the introduction of sanitary and hygienic measures that, as the foregoing table shows, the death-rate in 1910 was only 4·6, and in 1911, 4·8. This phenomenal reduction in mortality is shown to be even more remarkable in the statistics of our Indian troops.

The Director of medical services in India is at army headquarters and is the chief sanitary

authority of the army of our Indian Empire. He is the responsible sanitary adviser of the Commander-in-Chief in India, and is kept informed as to the state of the health of every unit through monthly returns, and special reports in the case of any serious epidemic disease arising.

Each division has a Deputy-Director or an Assistant-Director of medical services (principal medical officer). He has as his staff officer a deputy-assistant director of medical services (sanitary), until recently called the divisional sanitary officer, who is a trained expert in military hygiene and sanitation, and is provided with a fully equipped analytical and bacteriological laboratory. These divisional sanitary officers are appointed from the Royal Army Medical Corps. All brigades have a bacteriological laboratory with an executive medical officer (who is a specialist in bacteriology) in charge of it.

The divisional sanitary officer is a whole-time officer, whose duty is exclusively connected with the practical application of hygiene to the requirements of the troops in his division. He is also a trained analyst and bacteriologist.

Each battalion or unit has a medical officer, who is the sanitary adviser of the officer commanding the unit.

The first duty of a medical officer on joining a unit is to learn everything he has to know about the barracks and their surroundings and the state of health of all ranks.

With our troops in the Indian Empire we are at present inclined to look upon full hospitals as an indication of some defect in the sanitation of the barracks and their surroundings, or slackness in watching the condition of health of the troops in barracks. Such an inference is, of course, not universally or invariably justifiable in India or the Tropics generally; in the early stage of colonization in the Tropics full military hospitals have always occurred, and even now we in some years in India have waves of malarial fevers that fill our hospitals. The remark, however, holds good generally, and the experienced sanitarian can as a rule readily discover the cause of the defect or where the slackness exists.

The medical officer of a unit is primarily the health officer of the unit, and secondarily the medical officer for the treatment of the sick and injured; his highest function is not to treat disease, but to take steps to ensure that there will be as little disease as possible in his unit during peace and on active service. The real executive sanitary officers of our army in India are the company, squadron, and battery officers. Through them the sanitary and hygienic work required is carried out by all non-commissioned officers and men. It is for us to bring home to combatant officers that sanitation in the army, carried out in its integrity, means full and healthy ranks in the firing line. The sanitary work of the army must be part and parcel of the ordinary routine training. The extent to which regimental officers realize the great assistance sanitation affords them from a military standpoint will determine the actual state of the health of the army. It is our duty to endeavour to ingraft this fact and to induce them to fully appreciate their sanitary responsibilities.

All our military cadets have now to pass an examination in military sanitation before obtaining their commissions, and all subalterns of European units are obliged to pass a similar examination before promotion to captain.

Education of Troops in Military Sanitation in India.

Various courses of instruction are given in peace-time in our army in India as part of the routine training of the year. The following includes the more important subjects dealt with:—

Nature and causes of preventable disease in the soldier in peace and war in our Indian Empire; preventive measures in connection with enteric fever, bacillary dysentery and cholera; malarial fevers, their nature and causes, and the *rôle* of anophelines as malaria-carriers; hygienic and sanitary considerations connected with air and ventilation, the cleanliness of barrack-rooms, hygiene of barrack-room and tent life; water-supplies, their sources; public water-supplies; purification, distribution, and storage of water for troops in cantonments and on field service; food-supply, cooking of food; sanitation of kitchens, ablution places, latrines and urinaries; removal and disposal of excreta—pail system with trenching, night-soil incinerators; dry refuse, its collection and disposal; personal hygiene, camp sanitation, &c. The practical demonstrations were conducted by visits to barrack-rooms, cook-houses, ablution-places, latrines and urinals, water-supply works and wells, night-soil trenches and incinerators, regimental institutes, coffee shops, canteens, aerated water factories, dairies (in which the possible sources of contamination of milk were pointed out and the methods of sterilization shown and explained), and regimental bazaars; the slaughter-houses were visited, live animals and carcases inspected, the proper way of disposing of offal described; bakeries were visited and bread-making explained, and the dangers through dirty workmen indicated; laundries and *dhoby ghats* visited, and their proper working pointed out; the breeding-places of mosquitoes and method of dealing with them and the duties of mosquito brigades gone over, and anti-malarial and anti-mosquito measures demonstrated; the manner in which flies breed and the methods of preventing such breeding shown and dilated on, &c. The non-commissioned officers and men of the class were also taken into the field and made to carry out all the work they would be called upon to do on service in connection with water-supplies, latrines and trenches, urinaries, disposal of excreta by incineration or otherwise, disposal of dry refuse, sanitation of kitchens and the disposal of water therefrom, and camp sanitation generally.

In India the sanitary work of extra-regimental areas in each cantonment is in the hands of a cantonment committee.

In non-regimental areas in cantonments—bazaars,

villages, &c.—there is a regular system of sanitary inspection, of medical inspection of the people inhabiting them, and a rigid enforcement of notification of infectious diseases. The occasional sporadic and even epidemic cases of plague, small-pox, cholera, measles, &c., that affect troops are often initially introduced by the inhabitants of these areas.

There is a well-considered scheme ready at hand to meet all epidemic infectious diseases that are liable to arise in cantonments by importation or through local infection. Such a scheme is specially required in connection with enteric and paratyphoid fever, cholera, plague and small-pox. In this way no time is lost in dealing with initial cases and "contacts." It is scarcely possible for any person, whether soldier or non-combatant, to enter cantonments from an infected area without being previously inspected by a medical officer or medical subordinate. Everybody concerned knows from these schemes what one's duties are when any epidemic threatens. Copies of these schemes are in every hospital, brigade office, orderly room, and cantonment magistrate's office.

A strict and continuous policy for preventing the importation of infectious diseases from civil communities to cantonments and barracks is adopted.

The sanitary administration of indigenous troops in tropical countries is invariably a difficult matter, and in many countries a delicate one to handle, especially at its initial stage. In the Tropics medical and sanitary officers soon learn that they have to respect the prejudices of local troops, many of which are associated with religious ceremonial and the traditions of centuries. We should remember that in all tropical countries western sanitation is an importation, and that if not kept in operation by western sanitarians it would die out in a few decades. It is not yet ingrafted as part of the national life of peoples in the Tropics. All western nations with armies of indigenous troops in the Tropics have an important responsibility in inculcating the sanitary instinct during military life; these indigenous troops are dispersed to their village homes after leaving the service, and if they have been properly trained they will introduce part at least of our sanitation and system of preventing infectious diseases.

THE YELLOW FEVER DANGER FOR ASIA AND AUSTRALIA, ESPECIALLY AFTER THE OPENING OF THE PANAMA CANAL.

Dr. J. J. van Loghem, Director of the Institute of Tropical Hygiene, Department of the Colonial Institute, Amsterdam, Holland, called attention to the possibility of yellow fever spreading further, especially after the opening of the Panama Canal, as has been repeatedly pointed out; Manson, in 1903, read an important paper on "The Relation of the Panama Canal to the Introduction of Yellow Fever into Asia," at the February meeting of the Epidemiological Society.

As the question of the yellow fever danger for Asia and Australia, considered from the present point of view, is entirely entomological, we can restrict ourselves to a study of the distribution and biology of *Stegomyia* (*Ædes*) *calopus* in those continents.

Stegomyia on Board Ship.

Stegomyia calopus can remain infectious very long after having bitten a yellow fever patient; so if the mosquito finds on board the means of keeping alive there is danger of the disease being carried over distances. Repeated experience of the occurrence of yellow fever among the crew and dock-labourers during the unloading of ships has proved this.

In tropical seas stegomyia not only remains alive on board ship but sometimes also finds an opportunity of breeding, as is known from many observations.

Dr. Loghem, in a ship on the Java Coast, found in the cabins stegomyiæ, and their larvæ and pupæ, in the water-tank of the bathroom, and imagines against the sides of the tank; larvæ were also met with in the bilge water. Dr. Loghem added that at sea he soon got rid of the mosquitoes in his cabin; it seems that they are driven from on board in great numbers by the draught.

The self-cleaning of the ship during its course is certainly an important point, and the faster the ship runs and the better it is ventilated the less chance there is of its carrying yellow fever. On the other hand, it is clear that the advantages of the newer ships over the slow-going sailing-ships —one of the synonyms of yellow fever was ship's fever—is to a certain extent reduced by their dimensions being larger and their interiors more complicated. And then we are not to forget that the coast places in tropical seas are also connected by primitive native ships.

On account of all this it seems certain that as long as yellow fever occurs in America the chance remains of infected stegomyiæ being transported to Asia and Australia. Should the disease be transported to Asia and Australia and maintain itself there?

S. calopus occurs all over the world between about lat. 40° N. and S. Stegomyiæ have been found at all possible places in Asia and Australia within those boundaries; but we want quantitative data about stegomyia in its relation to man, in the same way as we desire them nowadays about rats and fleas or about malaria parasites and anopheles mosquitoes in a scientific treatment of the epidemiology of plague or of malaria, but few data are to hand on this matter.

Dr. Loghem found that *S. calopus* is of frequent occurrence in places along the coast of Dutch East India and also at a considerable height, 700 and 400 metres above the sea-level.

Dr. Baggelaar, writing from Fak Fak, in New Guinea, November 30, 1908, says: "I hereby send you some fifteen *S. fasciatæ*. It is swarming here with these wretched animals. They are only sur-

passed in their untiring zeal for biting by the wood mosquito. In the months of October to December they are most frequent. The specimens sent all have the 'lyre' intact, having been carefully selected from dozens of specimens."

If we compare the temperatures of Dutch India with the optimal temperature for breeding experiments with stegomyia, one sees that in Asia throughout the whole year the average temperature near the Equator is about equal to the temperature at which yellow fever can prevail in America, and remains only little below the average temperature at which the disease becomes a serious epidemic.

If from our observations in East Dutch India, which can by no means lay claim to completeness, any conclusion may be drawn, it must be this: it may be surmised that at various places in Asia and Australia stegomyia occurs in such numbers and under such circumstances that yellow fever, once transported there, will be able to hold its own and be propagated further.

Measures to be taken in Asia and Australia against the Yellow Fever Danger.

(1) Every ship arriving in the stegomyia zone from an infected or suspected port must remain at a sufficient distance from the coast, and be examined for mosquitoes, larvæ, and yellow fever patients. If this examination has a negative result, the ship shall be given free pratique.

(2) If mosquitoes and larvæ are found, they are killed, and yellow fever patients are carried from the ship in mosquito-nets and nursed in a mosquito-proof hospital.

But the trouble is that stegomyiæ may be on board, hidden in the cargo, without any chance of their being discovered by the harbour officials; among the patients with fever—but not clinically recognizable as yellow fever—there may be yellow fever patients; and among the healthy people may happen to be some in the incubation period of the disease.

So the conclusion which might be drawn from this is: That *every* ship having touched at an infected or suspected harbour in the stegomyia zone ought to be fumigated; that the *whole* (non-immune) crew ought to be kept in quarantine and observed for a few days, and that *all* the fever patients ought to be taken from on board in mosquito-nets and isolated in a mosquito-proof hospital.

As compensation for the mistakes that without doubt will be made in the execution of these measures, the campaign against stegomyia in the Asian and Australian ports ought to be started with all energy.

If, then, the ship mosquitoes really make victims on shore, the condition for spreading further is lacking.

In order to relieve the local sanitary services in the harbours of some of their work and responsibility, and to further the rapidity with which ships in the harbour are controlled, more things ought to be entrusted to the ships' doctors. I think that in the future a more important and more honourable task will be given them than nowadays; more specially will they be better prepared for their task.

With respect to the above-mentioned recommendations, the question naturally arises whether it would not be possible to join hands, and through international co-operation secure the safety that is not sufficiently guaranteed by the local measures in the harbours.

Manson's idea is confined to the defence of Asia by cleaning the ships on their voyage through the Panama Canal; this hygienic work ought to be internationally regulated and executed. Gray drew attention to the fact that yellow fever is endemic not only on the Atlantic, *but also on the Pacific side of America*. He pointed out the irregular political state in those countries, which does not guarantee the proper execution of hygienic measures in the harbours. So Gray wants all ships sailing from a yellow fever port to an Asiatic one, to be obliged to first touch at the fumigation station at Panama. He also thinks that international control of navigation should be kept there.

At the Congress for Hygiene in Berlin in 1907, the thought of international co-operation was uttered by Agramonte, who again clearly showed what danger the yellow fever centres in Ecuador, Colombia, Venezuela, &c., have for the whole tropical zone.

CURATIVE VALUE OF A "GLYCERINATED PEST VACCINE" IN PLAGUE.

R. Row, M.D.Lond., D.Sc.Lond., Petit Laboratory, Bombay, India, said that the vaccine above referred to differs from that previously used by the author, or that generally employed for prophylactic purposes, in that (1) it is derived from young first subcultures or the very first cultures on agar from peripheral blood in septicæmic plague cases, and (2) the plague bacilli are killed with the help of glycerine instead of with heat or salts, and it is free from any admixture of antiseptics.

The value of employing young first subcultures depends on the fact (*a*) that these are rich in a glutinous globulin-like protein, which is easily taken up by dilute NaCl solution, and is therefore more rapidly absorbed when administered subcutaneously, in contrast with that derived from subsequent subcultures. (*b*) That owing to the presence of this globulin-like protein forming, so to say, a light capsule round the individual bacillus, one obtains a uniform emulsion of the culture in normal saline solution, so that on making a smear of the emulsion on a slide one sees individually dispersed bacilli, and hardly any clumps such as are seen in a plague culture emulsion prepared in the ordinary way. This property, it is needless to say, is well adapted for accurate dosimetry.

The object aimed at by the technique is to have an agency which, while effectively sterilizing the emulsion, would on one hand allow no clump formation or production of a precipitate, and yet, on

the other, would not lead to the deterioration of the immunizing principle of the resulting fluid; after a great many attempts, glycerine added to a salt emulsion of plague culture, prepared as stated above, has been found to answer all these requirements. Further, it is found that in the presence of glycerine the enzyme action on the toxic substances of a crude plague emulsion is not in any way interfered with.

Technique of Dosage and Treatment.

The emulsion above described is stocked in the strength of one agar tube to 1 c.c. of 50 per cent. glycerine in normal saline (but it can be stocked in more concentrated form), and from this stock a dilution is made to represent the scrapings of one agar tube to 25 c.c. of the same glycerinated saline solution, and this is stored for use in small glass capsules of about ½ c.c. capacity. When required ¼ c.c. of this fluid is administered in any part of the healthy skin subcutaneously, taking the precaution of freely diluting it with normal saline just before the injection so as to minimize the temporary smarting caused by the glycerine. The dose usually employed is ¼ to ½ c.c., and therefore corresponds to the scrapings of $\frac{1}{100}$ agar tube, and on computation with various specimens of a two days' growth on the surface of the usual ¾ in. diameter tubes it is found to contain 85,000,000 to 90,000,000 plague bacilli. It is possible to make an agar culture at the bedside from the patient's peripheral blood, derived, say, from the finger-tip sterilized with ether alcohol, and this is best done as a part of the routine of the clinical examination. This way one can ascertain roughly if the case which is treated is of a septicæmic or non-septicæmic nature; for it is in the non-septicæmic cases only that any good can be done. Of 89 consecutive cases treated in this year's epidemic in Bombay: Septicæmic, 47: all died, no recovery. Non-septicæmic, 42: 7 died, 35 recovered, *i.e.*, 83·6 per cent. of non-septicæmic cases recovered.

Conclusions.

(1) General amelioration of all the symptoms is noticeable after a period of twelve to twenty-four hours of the injection.

(2) Gradual subsidence of the bubo and its complete absorption in most cases.

(3) In most of the non-septicæmic cases the rapid termination of acute infection process and uninterrupted recovery.

(4) Distinct reaction in the shape of exaggeration of the already existing symptoms, and a distinct increase of temperature during the first six to twelve hours of the injection in all favourable cases.

(5) The freedom from any after-effects or complications.

(6) The possible practicability of applying this vaccine for prophylactic purposes owing to the simplicity of the technique and the short time required for obtaining a vaccine, and also because it can be obtained as a uniform emulsion of any reasonable degree of concentration, and therefore well adapted for reducing the bulk of the injection to even less than ¼ c.c.

THE DINNER.

A dinner was held on August 8, 1913, consisting of the members of the Society of Tropical Medicine and Hygiene, together with the members of the Section of Tropical Medicine attending the Seventeenth International Medical Congress. Surgeon-General Sir David Bruce, C.B., LL.D., F.R.S., occupied the chair. Amongst those present were: Drs. Abraham, Anderson, Ayramonti, Bagshawe, H. G. Barrie, Fleet-Surgeon Bassett-Smith, Mr. Norman Bennett, Colonel Birt, Professor Blanchard, Mr. James Cantlie, Lieutenant Colin Cantlie, R.N., Dr. Chacin-Utriago, Captain Powell Connor, Dr. E. de Freitas Crissiuma, Major Cummins, Dr. J. T. Darling, Dr. C. Noel Davis, Dr. McKenzie Davidson, Professor Eijkman, Dr. Evers, Dr. L. G. Fink, Dr. Franchini, Professor Fülleborn, Colonel Gimlette, Dr. R. Gonder, Dr. Harford, Dr. Hata, Colonel Hehir, Dr. Hinke, Major Jackson, Dr. Lannelongue, Professor Laveran, Dr. Leiper, Sir W. Leishman, Dr. La Rocha Lima, Major Liston, Dr. G. C. Low, Sir Patrick Manson, Surgeon-General Martini, Dr. Yale Massey, Professor Minchin, Dr. Murray, Professor Nattan-Larrier, Professor Dr. Nocht, Dr. Nusia, Professor Nuttall, Dr. O'Connor, Dr. Œpp, Sir Ronald Ross, Dr. Sambon, Dr. Sandwith, Professor Schaumann, Dr. Schilling, Dr. Schilling-Torgau, Sir David Semple, Mr. Sheather, Mr. Sheppard, Dr. D. Thomson, Dr. Tschudnowsky, Mr. J. A. Valentine, Dr. van Loghem, Professor von Wasielewski, Dr. Malcolm Watson, Dr. Duncan Whyte, Colonel Wilkinson, Dr. Wu Lien Tieh.

Sir David Bruce, after giving the loyal toasts, proposed "The Progress of Tropical Medicine." He began by stating that it was Sir Patrick Manson's discovery of the part played by mosquitoes in the conveyance of the disease filaria from man to man that gave the key to our modern scientific methods of investigation and research. Manson, then a lonely practitioner in the distant island of Formosa, not only framed, but proved the mosquito-filaria theory, and it is surely one of the most wonderful pieces of work ever accomplished by any medical man to whom laboratories were inaccessible and methods of investigation untaught. M. Laveran, the doyen of French tropical medicine, by his discovery of the malaria parasite in the blood of man (1878-79) acquired everlasting fame for himself and the eternal gratitude of mankind, for his discovery constituted the fountain to which all modern tropical pathology may be traced, and whence our knowledge of disease flows and gathers strength. In 1886 the parasite of undulant (Malta) fever was discovered, and later the part played by goat's milk in the spread of the disease by Bruce and others.

Sir David stated that this disease was now

known to be widespread, and amongst other distant regions in which undulant fever is known he mentioned that he had found it amongst the people inhabiting the shores of the Albert Edward Lake, in Africa, and it is interesting to know that these people drink goat's milk.

In 1889 Smith and Kilborne, by their discoveries and investigations, gave us babesia. Of many workers in India the name of Lewis will always be mentioned with respect. Sir Ronald Ross's fame will go down to posterity as the man who proved the mosquito-malaria theory (1898), and thereby showed that the mosquito was the means by which malaria was conveyed to man. Sir Wm. Leishman, in 1903, found the key to that mysterious disease kala-azar, and introduced us to a new pathological entity, the Leishman-Donovan body. The plague bacillus was discovered by Kitasato and Yersin in 1904, during the epidemic in Hong Kong; and Simond, Gaultier and others by their investigations showed that the rat was the alternative host and that the rat-flea was the carrier of the disease. The Indian Commission, by its careful analysis of plague transmission, showed that without fleas the transmission of bubonic plague from rats to man was impossible.

The Chairman paid a cordial tribute to the epoch-making work on yellow fever by Lazear, Read, Carroll and Agramonte, and to the great practical issues solved by Colonel Gorgas on the Panama Isthmus.

The investigations of Eijkman and Braddon in beriberi, the solution of sand-fly fever in 1909 by Doehm, and many important additions to our knowledge by a host of workers, show how knowledge is progressing, and Sir David said he gave the toast of "The Progress of Tropical Medicine" with all confidence.

M. Laveran, in replying to the toast, stated that for the first time tropical pathology and hygiene had a special section devoted to them at the International Congress of Medicine. He hoped this happy innovation would strengthen the bonds of these existing societies of tropical pathology.

M. Laveran thanked Sir David Bruce for the honour he had done him in mentioning his work in his remarkable speech upon the progress of tropical pathology; he congratulated Sir David Bruce upon the great part he had played in its progress; his work on nagana, upon sleeping sickness and upon undulant fever, constituted an imperishable memorial to him. The men belonging to M. Laveran's generation could well appreciate the immense progress that had been made in tropical diseases. When they made their medical studies they were reduced to making hypotheses upon the nature and propagation of these diseases. Plague, cholera, dysentery, malaria and yellow fever were attributed to the emanations from vegetable or animal matter, and it was supposed that the infection was produced by the respiratory tract.

To-day can be shown the bacillus of plague, cholera, hæmatozoa of malaria, amœbæ of dysentery, the spirochete of recurring fever, the trypanosomes of sleeping sickness, and a number of trypanosomes of animals, organisms of leishmania, piroplasmosis, &c., and often one could see by the side of a pathogenic microbe the insect which propagated it, such as mosquitoes, bugs, flies, &c.

The great part played by these blood-sucking insects in the etiology of tropical diseases is one of the most interesting facts that have been revealed. The merit of this revelation rests with Sir Patrick Manson, who first proved the part that mosquitoes play in the propagation of filariasis.

It was in studying these works that M. Laveran was able to verify the statement of the propagation of paludism by the mosquito, which hypothesis has been completely verified by the admirable researches of Sir Ronald Ross. So the most celebrated aphorism of Chancellor Bacon has been verified, "*Bene scire est per causas scire.*"

The prophylaxis of tropical diseases has made invaluable progress. Since their etiology was known plague, cholera, paludism and yellow fever have become preventable diseases. All who have contributed to this work deserve great merit on the side of science and of humanity.

Sir Patrick Manson, in his reply, recalled the time when he brought the news of filarial periodicity and of the transmission of filariasis by the mosquito to London some thirty-three years ago. The astounding facts he enunciated were neglected or received with something akin to ridicule. Some seventeen years later, when he unfolded the mosquito malaria, his medical colleagues were not quite sure of his sanity, and used to tap their foreheads significantly when he appeared amongst them. Sir Patrick dwelt upon the necessity of supporting the Schools of Tropical Medicine, they being the real foundation for all that is necessary in the fight against disease in the Tropics.

The toast of "The Visitors and Guests" was given by Sir Ronald Ross, F.R.S. In felicitous terms he referred to the presence of their French visitors and guests, represented by Laveran, Blanchard and others; of their German colleagues, by Nocht, Fülleborn, and others; and drew special attention to the contributions of Koch to tropical medical literature; of the great school of Italian investigators, represented at this meeting by Rho, the Medical Director-General of the Italian Navy; of Holland, ably represented by Professor Eijkman; and he commented upon the importance of the presence of Agramonte (Cuba), Kopke (Portugal); to many men of renown from South America; and lastly, but not least by any means, the representatives of Japan and China, Dr. Wu, of the Chinese service, taking an active part in the discussion.

The toast was responded to by Professor Agramonte, Professor Eijkman, Professor Blanchard and Professor Fülleborn.

Professor Blanchard, in his reply, paid a sincere tribute of respect to Sir Patrick Manson as the pioneer of tropical medical studies and the father of modern tropical medicine. He referred to the rapid growth of the London School of Tropical Medicine, which was now capable of accommodating

a large number of students. Miasma as a cause of disease was now forgotten. Sanitation has enabled us to master the great scourges of the Tropics, and the microscope had revealed their causes.

Professor AYRES KOPKE's name appeared on the programme as the proposer of the toast of the "Health of the Chairman."

Annotations.

A Case of Trichinosis.—Bernstein, in the *Medical Record*, June 28, 1913, describes a case of trichinosis, with autopsy.

The patient, an Italian, was admitted to the Lebanon Hospital under Dr. Mayer. His present history dated back some ten days, when he had several severe chills followed by a rise in temperature, generalized pains, vomiting, and diarrhœa. His physical examination on admission showed nothing pathological except in his musculature—his forearms were flexed on his arm, and it was impossible to extend them passively or actively—attempts to do so causing excruciating pain. His mouth could be opened for only about half an inch, while he was unable to protrude his tongue beyond the line of his teeth. Pressure over any of the muscles of the extremities, chest, or head caused severe pains. His temperature ranged between 100° and 104° F., with a pulse-rate of 100 to 112.

Urine analysis constantly gave a strongly positive diazo-reaction. This test is too often neglected in the diagnosis of trichinosis, and yet it is a very valuable help, being almost always positive. Examination of fæces was negative.

A blood examination showed a leucocytosis averaging about 17,800, with an eosinophilia of 7½ per cent. Blood culture was sterile. A careful search for embryos in the blood was negative, while animal experimentation, in the attempt to convey the disease from the patient's blood to guinea-pigs through feeding, was also without result. Since these examinations were performed long after the embryos had left the circulation, the failure to find or convey them is not to be wondered at. A section of the left gastrocnemius muscle, teased in normal saline solution, showed numerous motile specimens of *Trichina spiralis*.

The patient died after sixteen days in the hospital, and the *post-mortem* examination was performed four hours after death. It revealed no gross pathological lesions in any of the organs.

Microscopically, the trichinæ were found in all of the voluntary muscles, including the intercostals, psoas, sternocleidomastoid, and diaphragm. They were, however, most numerous in the musculature of the tip and base of the tongue. As mentioned before, the intestinal and heart muscles were negative, as were also the liver, kidneys, suprarenals, spleen, lungs, and pancreas.

In conclusion, the author emphasizes the following facts in diagnosing trichinosis:—

(1) Examine the urine for the presence of a diazo-reaction.

(2) Do not expect to find embryos in the stools of an established trichinosis case.

(3) The parasites are in the circulation for but three weeks at most.

(4) The embryos are deposited in the voluntary muscles only.

Personal Notes.

COLONIAL MEDICAL SERVICES.

West African Medical Staff.

September, 1913.

Death.—P. F. Foran, F.R.C.S.Ireland, L.R.C.P.Ireland, Medical Officer, Southern Nigeria.

No transfers.

Resignations.—W. Morrison, M.B., Ch.B.Edin., Medical Officer, Northern Nigeria; W. Browne, L.R.C.P., L.R.C.S. Edin., L.F.P.S.Glas., Medical Officer, Southern Nigeria.

Retirements.—C. T. Costello, B.A., M.D., B.Ch., B.A.O. Dublin, retires on pension; M. W. Ruthven, M.B., Ch.B.Edin., D.T.M.Liverpool.

New Appointments.—The following gentlemen have been selected for appointment to the Staff: C. J. H. Pearson, M.R.C.S.Eng., L.R.C.P.Lond., M.B., B.S.Lond., Northern Nigeria; B. W. F. Wood, M.B., B.S.Leeds, Northern Nigeria; H. North, M.R.C.S.Eng., L.R.C.P.Lond., Southern Nigeria.

Other Colonies and Protectorates.—A. D. Clanchy, L.R.C.P. and S.Ireland, and Leslie Webb, M.R.C.S.Eng., L.R.C.P. Lond., have been selected for appointment as Medical Officers, Uganda; P. F. Nunan, M.D., B.Ch., B.A.O.Dublin, L.M. Rotunda, J. H. Thomson, M.B., B.Ch.Aberd., G. Dunderdale, M.D., B.S.Lond., M.R.C.S.Eng., L.R.C.P.Lond., and J. H. H. Pirie, M.D.Edin., M.R.C.P., F.R.C.P.Edin., have been selected for appointment as Medical Officers, East Africa Protectorate; J. H. C. Greene, B.M., B.S.Dublin, has been selected for appointment as a Medical Officer, Federated Malay States.

Business and Other Notices.

1.—The address of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE is Messrs. BALE, SONS AND DANIELSSON, Ltd., 83-91, Great Titchfield Street, London, W.

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Original Communications.

A REVIEW OF A CLINICAL STUDY OF MALARIAL FEVER IN PANAMA.

By JOHN PELHAM BATES, M.D.
Ancon, Canal Zone, Panama.

V.

ADMINISTRATION OF QUININE IN MALARIA.

A REVIEW of the literature on the subject of the administration of quinine for the cure of malaria discloses the fact that the question is far from being a closed one. The quantity of quinine necessary to control the malarial attacks is still debated, and the question as to whether small doses frequently repeated, or whether larger doses at wider intervals are the most efficient to control the febrile attacks have their advocates both *pro* and *con*. The question of the time in the life phases of the malarial organism when the quinine is most effective in the destruction of the organisms, is now settled. This time is accepted by all to be in the stages of the active development of the parasites, and all agree that the effectiveness of the drug continues on the intracellular organism but with progressively decreasing potency till about maturity, where it ceases altogether.

With this part of the subject settled, it would appear that all would at once agree then that quinine should be administered at the time of the day which would introduce the drug into the circulation in greatest concentration during the youngest developing stages of the organisms, but, as a matter of fact, clinical experience has proved that such a method of administering quinine is not at all necessary to produce quite satisfactory clinical results, and as it is not always feasible to await a choice of time to administer quinine, many have come to hold the view that quinine given in moderate doses frequently repeated is as a rule the method of choice. The contention for the effectiveness of what may be termed small daily quantities of quinine, that is, 15 to 20 gr. as average doses, and 30 to 40 gr. as maximum quantities, it appears to me, is brought about by willingness to permit the febrile course of malaria to continue unchecked unnecessarily long.

It would be well here I think to again call attention to spontaneous recovery in malaria, in order to estimate the value of treatment by either small, average, or large daily quantities of quinine. Most workers in malaria have for various purposes left off quinine in cases of ordinary gravity, to find that such cases usually terminate their course in about ten or fifteen days with rest and restricted diet. Some of these cases terminate spontaneously in much quicker time than this. In a series of cases in which I refrained from giving quinine, to study the temperature curve and life phases of parasites, I was surprised in one case to find the temperature had ceased after the fifth day from admission, and from the cessation of the temperature the parasites disappeared to such an extent that the study of the blood was no longer profitable. This case was a quotidian infection, and the blood smears at first were fairly rich in parasites. It is easy to see in this case what effect small doses of quinine would have had and what impression this therapy would have made on the mind of the observer in this isolated instance. But, on the other hand, while this study was being carried out, another case presented itself, a subtertian infection, which appeared about equal to the first case, and the patient on admission seemed no more ill, but the illness pursued no such course as the first one. Instead of the symptoms becoming milder and milder each day, as was seen in the first case, they grew worse from day to day, until on the fifth day from admission the patient began to show symptoms which made me fear if he were continued without quinine much longer the illness would terminate in a pernicious attack; hence quinine was begun at once. The parasites in this case also behaved differently from the parasites in the first. They began to increase in number with the increase in the gravity of the symptoms, and what is more significant, as I shall show later, their characteristics began to change; they were now no longer nearly all the same age and in the ring forms, but grown forms began to appear in the smears, presegmenting and segmenting bodies in moderate numbers, together with occasional crescent forms. The quinine in this case was given in doses of 10 gr. three times a day, with satisfactory results.

Here then two cases are shown, in which, from all appearances at the time of admission which could be judged from the blood examination and the clinical symptoms, ought to have pursued a similar course. Yet some undetermined factor did not permit them to do so. By contrasting these two cases, it is quite evident that the same quantity of quinine administered to each would not have produced a similar result for each. In the first case, 3 to 5 gr. of quinine a day would have sufficed to produce satisfactory clinical results, while in the second case 30 gr. a day was necessary to do so. Thus, from the study of these two cases, and many similar ones, the conclusion has been reached that quinine must be increased in quantity to meet the gravity of the infection. For one to undertake to grade the doses of quinine in proportion to the gravity of the infection in every case is, of course, out of the question, and in trying to avoid such a difficult process, the general experience of all workers has at last arrived at average doses for the largest majority of all cases of malaria, which is about 30 gr. a day. Experience here has proved that the quantity of quinine that can be administered for short periods of time without danger to the patient is very much larger than is generally advised.

The largest majority of all cases of malaria are of moderate severity, and will terminate their course spontaneously in ten to fifteen days, or twenty days at most; this holds good for tropical climates as well as temperate; thus it is that we find 30 gr. of quinine a day sufficient to meet the requirements of the greater number of malarial cases. But in severe malarious countries a goodly portion of the

cases, like Case 2 already noted, do not tend towards spontaneous recovery, but pass beyond the average into the grave and pernicious types. In these types all agree that quinine should be increased in doses beyond the average of 30 gr. a day, but the question becomes, to what extent should quinine be increased to be effective in those types of malaria? Craig [1] states that 40 gr. a day should *never* be exceeded, while others do not specify any limit, but very few recommend quantities exceeding 45 gr. a day. In our hospitals here it has been found necessary to exceed very greatly these quantities of quinine in the grave and pernicious types. We first increase the quinine for the therapeutic tests for differential diagnosis, and second, to meet the requirements of the very grave pernicious attacks. The routine practice is to administer 20 gr. of quinine in solution when the patient is admitted to the hospital, and continue thereafter with 30 gr. a day. For the therapeutic test quinine is sometimes increased to 45 gr. a day for one or two days, and then reduced to the usual 30 gr. a day. In the grave and pernicious cases quinine is administered in quantities of from 60 to 90 gr. a day, according to the gravity of the case. In my individual work I have in many instances exceeded even these quantities, and I have administered 120 gr. in the first twenty-four hours. *I do not, however, continue quinine in these massive quantities for a period longer than twenty-four hours.* Experience has taught that it is useless to continue quinine in such massive quantities for a period longer than twenty-four hours. If quantities such as 90 to 120 gr. in twenty-fours do not suffice to effect relief, the infection has already passed the stage where treatment can be of any avail. In fact, cases of such gravity as to call for quinine above 80 gr. in the first twenty-four hours usually prove fatal within this period, and one rarely succeeds for the lack of time to introduce 90 to 120 gr. of quinine into the system. If quinine has in this time proved beneficial, the remedy is immediately reduced to 45 gr. a day, where it is allowed to remain for the next succeeding twenty-four to forty-eight hours, when it is again reduced to the usual 30 gr. a day. In the cases in which I have succeeded in administering these massive quantities within this period, I have felt that I had succeeded in saving the patients' lives; at least, I have had the satisfaction of knowing that I did them no harm, for I have seen no evil results following this method of administering these large doses of quinine.

There is a small percentage of pernicious fevers in which I think the quinine ought to be much more rapidly reduced than is stated above, and in some instances even discontinued for a time. I have already called attention under the head symptoms of malaria to a class of pernicious fevers in which the parasites disappear rapidly from the circulation under treatment—the disappearance of the parasites is not merely from the peripheral circulation, but it is from the circulation as a whole, as is shown by autopsy smears—yet, in spite of this fact, the gravity of the symptoms continues to increase, and death takes place on the fourth, fifth or sixth day from admission. In this class of cases, as the cause of death has not been clearly ascertained, one can well assume that the quinine itself may be a contributing factor towards death. At all events, the quinine has served its purpose, and there can be no good reason for its continuance, as experience has proved that continuing the quinine does not prevent death; therefore, it ought to be rapidly reduced. The indication for the reduction of quinine in this class of cases can be easily ascertained from the examination from time to time of the blood of the periphery.

Indication for Increasing the Dosage of Quinine.—The indication for increasing the dosage of quinine is first noted from the examination of the blood smears. The gravity of the infection will, as a rule, be indicated by the number of parasites seen in the smears, though this rule does not hold good in either direction. Thus, one may see smears very rich in parasites, yet no pernicious symptoms will follow, and, on the other hand, one may see in rare instances only a moderate number of parasites in the smears, but, nevertheless, the case will terminate in a pernicious attack in a few hours. One of the significant indications as to the gravity of the infection is the characteristics of the parasites as seen in the smears; that is, the developing stage of the organism as seen in the peripheral blood. When full-grown forms, presegmenting and segmenting bodies begin to appear in the blood of the periphery, it always indicates that the infection has continued for some days, as these forms are rarely seen in the peripheral blood in the quotidian and subtertian infections, except when the symptoms are grave, or pernicious symptoms are already present. Another indication of rapidly oncoming pernicious symptoms is, when in puncturing the lobe of the ear or finger for examination purposes, one finds that the blood is made to exude with great difficulty. In these instances the blood is dark, it clots quickly, and smears unevenly. This is an indication that the circulation is already embarrassed in the capillary system from blocking by the parasites or by the weakening of the circulatory organs from toxins. The clinical symptoms may now be correlated with these findings in the blood examinations for further aid in the indication for increasing the dosage of quinine. It was stated under the head of "symptoms in malaria," that certain mental aberrations manifest themselves before the onset of active pernicious symptoms. These mental aberrations are, the inability for consecutive thought, difficulty in recollecting events in the illness, or at times moroseness, or an unwillingness to make any mental effort, and at other times there will be vague wanderings away from the bed, and so on. These clinical symptoms, in conjunction with the blood findings already noted, such as the richness of the parasites in the smears, or the presence of sporulating forms and crescent bodies, always indicate that if quinine is not pushed, the illness will eventuate in an active pernicious attack. The absence of these symptoms, even with large numbers of parasites, indicates that the case will probably pursue an average course, and one may begin the treatment with average doses of quinine, but ready at all times to increase the dosage

if untoward symptoms arise; but, on the other hand, if these mental symptoms are present, although there may be only a moderate-appearing infection, one should push the treatment boldly. In these cases with grave symptoms, though not yet quite pernicious, quinine should be administered in quantities of 45 or 60 gr. for the first twenty-four or forty-eight hours. Where active pernicious symptoms are already present when the patient comes under observation, the larger doses of 80, 90, or even 120 gr. are indicated to be given but only for the first twenty-four hours. In those cases with the embarrassed circulation, I have always looked upon this condition as an indication for intravenous injections of quinine, also in as large doses as can be given in proper dilution, usually 20 gr. in 10 c.c. of water. Intravenous injections are now practised by Dr. W. M. James, in Ancon Hospital, in large dilutions, somewhat after the method of salvarsan injections. I have had no experience with this method.

The Time of the Day to Administer Quinine.—In Ancon Hospital it had been a routine practice to administer quinine in 10-grain doses three times a day, while in Colon Hospital the practice, as introduced by Brem [2], has been to administer quinine in 15-grain doses at 6 and 11 a.m. Both of these practices have been equally satisfactory clinically, but I am nevertheless partial to the twice-a-day method, with both doses given in the forenoon. It has the advantage of being less troublesome to the patient, and as a majority of the cases of malaria have their paroxysms in the forenoon, the twice-a-day method has the added advantage of putting the quinine into the circulation in greatest concentration at about the time that sporulation most frequently occurs, thus permitting the quinine to act most effectively on the young organisms. But when it becomes necessary to increase the dosage to 45 gr. a day, or more, it is then not feasible to continue the administration in twice-a-day doses. Under such circumstances I usually administer for the 45 gr. a day three 15-grain doses during the day, or for the 60 gr. a day four 15-grain doses. For quantities above this. quinine is administered in 10-grain doses every two or three hours as the case seems to indicate.

The Methods of Administering Quinine.—I shall here discuss briefly the methods of administering quinine. Such a discussion would hardly require the space if it were not for the fact that a general impression seems to prevail, that when quinine is administered hypodermically it has a like potency, and acts in the same degree of efficiency as the other highly soluble drugs such as strychnine or morphine, when administered in this manner. This assumption thus makes the hypodermic method of administering quinine the method of choice when one is desirous of putting quinine into the system in the greatest quantity in the least time. I suppose this idea is deduced from the fact of the prompt and full effect produced by hypodermic injections of the soluble salts of the more powerful drugs which can be administered in minute doses. But with quinine the case is hardly similar. Quinine is not very soluble at best, and the quantity administered is enormous when compared to the very soluble salts that are usually administered hypodermically. To a certain extent it is found that quinine when administered hypodermically follows the rule of the other soluble drugs when administered in a like manner, in that it appears in the urine more quickly than when administered by the mouth, but it by no means follows that the full quantity of quinine injected is all absorbed, or, even if it is all absorbed, that it is absorbed rapidly. In fact, clinical experience would lead one to infer that when quinine is administered hypodermically the full quantity is slowly absorbed, and in many instances scarcely absorbed at all. Rogers [3] has pointed out by comparison of charts that the fever may not be checked as promptly by quinine administered hypodermically as when administered by the mouth, and Thayer [4] notes that a large percentage of the salt is precipitated in the tissues when it is administered hypodermically. Indeed, it is a too common experience after a hypodermic administration of quinine for one to be confronted by patients with deep-seated indurated painful masses at the site of the injection. These masses may remain for a week or more to slowly absorb, or finally, a certain per cent. of them break down by coagulation necrosis into large sloughing indolent abscesses, and this untoward event occurs in spite of all aseptic precautions. Thus, it appears to me that while quinine administered hypodermically is our sheet anchor in a great many pernicious cases of malaria, it is nevertheless not a method of election but a method of necessity. Therefore, I think when quinine is administered by the mouth and already in solution, it is even more efficacious than by hypodermic injection. I make it a practice to follow the method of administering quinine by the mouth as long as the patient can be induced to swallow. Even when vomiting is a troublesome problem, a little patience and a little perseverance will be rewarded by surprisingly satisfactory results. By repeating the doses of quinine in small amounts, 10 gr. or so, after each rejection by vomiting, with such other symptomatic remedies as may suggest themselves, a small hypodermic injection of morphia or hot sinapisms over the stomach for instance, one will find that the vomiting will cease, and that the patient can continue to take quinine with a fair degree of comfort.

Intravenous Administration of Quinine.—Intravenous injection of quinine is, of course, unquestionably the most rapid and efficient means of administering the drug, but unfortunately this method is not without danger to the patient. Thayer [5] has reported a case in which death occurred immediately after the intravenous injection of quinine, and I have had one case in which the symptoms became very alarming just at the close of the operation. In this case the pulse ceased to be perceptible at the wrist, the mucous membranes became cyanotic, and the respirations shallow and sighing. On account of the danger to the patient, I have been timid about adopting this method, and have not used it except in cases in which I felt that no other means of administering quinine could be of any benefit, that is to say, I have used the method only as a last resort. My results,

therefore, have not been satisfactory. All the cases of pernicious malaria in which I have used intravenous administration of quinine have died in from two to eight hours after the administration of the drug in this manner. Nevertheless, I am not condemning the method, and I think I could have made it perhaps of use to me if I had made a better selection of my cases.

McGilchrist [6] has of late brought forward the method of hypodermoclysis, thus using high dilutions of the drug. This method has been used by James [7] in Ancon Hospital, and at first reported favourably, to be later abandoned. It was attended by too much pain, and from the exhibition of James's charts, in which in some the temperature persisted for nine days, I think that this latter method is not as efficacious as even the hypodermic method.

The Prevention of Relapse.—I am beginning of late to be inclined to the postulate that malarial parasites become feebly "fast" to quinine when they are forced to develop through several generations in weak dilutions of the drug in the circulation. If this then is true, interrupted periods of administering quinine is the proper method for preventing relapses. Experience has taught that interrupted periods of administration of quinine has at least this advantage, and that is, that patients will in most instances persist in this method of their own accord, when they will not continue quinine in regular daily doses in quantities sufficient to be efficacious. It is an old practice to administer quinine in interrupted periods of about one week interval. Marchiafava and Bignami[8], so far as I am able to learn, were the first to adopt the interrupted method of administering quinine in relapses, and they insist from their experience that it is the best method for preventing the recurrences. I have also found this method very efficacious when dealing with intelligent patients. I pursue the method in the following manner: from the last day of the subsidence of the fever I have the patient count forward seven days, and make a note of the date, and each seventh day thereafter is noted for six weeks, and preferably eight weeks. On the day before the seventh day the patient is instructed to begin quinine in full doses, usually 30 gr., and continue it through the seventh or pivotal day, and continue it throughout the next day following. Then discontinue until the next period, and thus continue the treatment throughout the specified time. As I have already stated, to obtain results by this method presupposes intelligence on the part of the patient or his guardian.

Effect of Quinine in Large Doses.—As I have stated, the quantities of quinine we administer here in our hospitals are larger than are usually administered in any other institutions, and I judge it will be of interest to make known the effect these quantities have on the patients. As I have already stated, so far as I can see it has had no evil effect in any manner.

If it has been the cause of precipitating blackwater fever, there has been no means of ascertaining this fact, but apparently it has not done so. It has left no permanent ill-effects upon the hearing or sight, and I have seen only one instance of quinine amblyopia, and this occurred while the patient was taking 30 gr. a day. In one case quinine in solution was administered, by accidentally overlooking a patient, in 30 gr. a day doses for a period of seven months, at which time no ill effects could be noted, and the patient stated that he had long since ceased to be troubled by ringing in the ears or other unpleasant symptoms. It was not unusual in my wards in the press of heavy work to overlook patients in the manner as stated, and allow them to continue on quinine of 30 gr. a day for periods of two or three months. In these instances there was no apparent ill effect from the drug.

I have in this series of papers stated to the point of tediousness that if quinine is administered in malaria in an efficient manner one may always expect that the febrile course will be checked in from one to five days. I have herein set forth what I consider the efficient administration of quinine. There are several adjuvants to quinine in malaria which make for the efficiency of the treatment, and to obtain the best results one must insist upon them. The first of these is rest in bed during the febrile stage, no matter whether the case is mild or severe. The second is restricted diet, and the third is prevention of continuous reinfection of the patient in his own surroundings. Thus, in our hospitals here the patient is kept in bed until the fever is completely controlled, and the diet during this time is always liquid. After the fever is completely broken, the patient is allowed to be about the ward in moderation, and soft diet is allowed during this time, but it is served at the bedside. After from *two* to several days on soft diet, according to the gravity of the illness, full diet is allowed, and the patients are permitted then to go about the wards as they please until discharged. Routine doses of quinine are of course continued during the entire stay of the patients in hospital.

In the preparation of these articles I have been confronted by a paucity of literature and have had to depend largely on current text-books. On account of the richness in material and the completeness of the work, I have drawn very liberally from "Malaria in the Twentieth Century Practice of Medicine," William Wood and Company, New York, by Marchiafava and Bignami, to whom I wish to express my profound obligations. I wish also to continue my thanks to Colonel W. C. Gorgas, Chief Sanitary Officer, Isthmian Canal Commission, for permission to publish these articles, and to thank Major Robert E. Noble, M.C., U.S.A., Dr. S. T. Darling, and Dr. W. M. James for encouragement and suggestions.

BIBLIOGRAPHY.

[1] Craig, Chas. F. "The Malarial Fevers." Wm. Wood and Co., New York, 1909.

[2] Brem, W. B. "Studies of Malaria in Panama"—(1) "Clinical Studies in the White Race," *Arch. Inter. Med.*, vol. vi, pp. 646-661, December, 1910.

[3] Rogers, L. "Fevers in the Tropics," pp. 232-233, 1908.

[4] THAYER, WM. S. "On Malarial Fever, with Special Reference to Prophylaxis," Harvey Lectures, Series 1911-1912. J. B. Lippincott and Co., Philadelphia.

[5] THAYER, WM. S. "Grave Malarial Fever with Few Parasites in the Peripheral Circulation, Dangers of the Intravenous Injection of Quinine," Reprint of remarks made before the Johns Hopkins Society on October 17, 1909.

[6] MCGILCHRIST, A. C. *Paludism*, Simla, No. 2, 1911.

[7] JAMES, W. M. "A Preliminary Report on a Practical Method for Preventing the Development of Pernicious Malaria," *Proceedings of the Canal Zone Medical Association*, 1911, vol. iv, Part I.

[8] MARCHIFAVA and BIGNAMI. "Malaria," *Twentieth Century Practice of Medicine*, vol. xix, 1902.

ACQUISITION OF ACID-FAST PROPERTIES BY A FILAMENTARY ORGANISM CULTIVATED FROM AN ANIMAL INJECTED WITH A CULTURE OF HANSEN'S "BACILLUS."

By J. MARTINEZ SANTAMARIA, M.D.

Bogota.

ON June 10, 1911, Dr. Bayon injected 1 c.c. of a saline emulsion of Kedrowsky's strain of leprosy intra-peritoneally into a white mouse. The animal was killed four weeks after; on necropsy numerous small white nodules were found on the surface of the various abdominal organs. Fragments of the spleen were taken with aseptic precautions, the piece in no case being bigger than a millet seed; these were placed on glycerine-agar.

The microscopical examination of the inner organs showed in the liver and spleen deposits of the acid-fast organisms injected. The tubes so inoculated were placed in the incubator at 37° C. and two weeks afterwards a small whitish growth was noted between the edge of the fragment of spleen and the culture medium. This was found to consist of a non-acid-fast, branching filamentary organism, morphologically identical to the one cultivated by Dr. Bayon from a case of leprosy. The spleen particle was removed and the tube again placed in the incubator. As the culture, however, did not appear to thrive, it was transferred to a tube of Dorset's medium on the tenth day from the first observation of the culture. On this medium rapid multiplication took place. At the end of fifteen days the surface of the medium was covered with a white, creamy, smooth and moist growth. On microscopical examination it was found that though the branching, filamentary organism was absolutely non-acid-resisting, small granules, such as have been described by Kedrowsky in his original filamentary culture, could be seen scattered among the filaments and these granules had retained the carbol-fuchsin stain; in other words, we found here an exact counterpart of the appearances described by Kedrowsky in his original culture of leprosy.

This examination was repeated fifteen days later and showed that these acid-proof granules had apparently increased in number, and, moreover, short, plump, elongated, acid-fast bacteria had made their appearance. They were, however, too short to be called "bacilli." Later on they however grew longer and definite rods could be detected.

Now, fourteen months after the original culture, the original Dorset medium is reduced to a brown mass, where, alongside with the acid-fast rods, a long filamentary and branching absolutely acid-fast organism is to be found in great quantity.

This series of observations show for the first time on an artificial medium the cycle of evolution from a non-acid-fast filamentary, branching organism to an acid-fast "bacillus." Similar results have been recorded by Kedrowsky, and later by Bayon in connection with the organism of leprosy after injection into animals, and I consider that these observations confirm the experiments of these authors, and show that the failure to cultivate the organism of leprosy was due to the fact that the cultures obtained from lepers (branching, filamentary, non-acid-fast organism, and partially acid-resisting diphtheroids) were cast aside as contaminations before a complete and thorough study of their properties had been made.

A FIBRO-SARCOMA IN A NATIVE OF CENTRAL AFRICA.

By A. YALE MASSEY, B.A., M.D., C.M.Tor.

Lusambo, Belgian Congo.

IN April, 1911, a male native of about 25 years consulted me for a fungating growth on the vertebral

Native with fibro-sarcoma on his back. Central Africa.

line of the back. He was then in moderately good health, and said that the tumour had been growing

for more than a year. He was kept under observation for three months, during which time the tumour increased in size about one-third. It was always nodular about the everted edges, the centre being soft, depressed, and bathed in pus, and bleeding at the slightest touch. The health of the patient became gradually worse, and when I operated his weakness was so great that he could scarcely stand. Under local anæsthesia—eucaine and adrenalin by infiltration—the tumour was easily removed, and proved to be superficial to the spines of the vertebræ. It weighed 900 grm. Skin grafts were unsuccessful, but the surface was completely healed in three months, and in six months the patient was in robust health. An examination of the patient eighteen months after the operation revealed no indication of any return of the tumour.

I am indebted to Dr. Bashford, of the Imperial Cancer Research, Queen Square, London, for the following report:—

"Fibro-sarcoma, in parts very cellular, having typical structure of a spindle-cell sarcoma, probably of slow growth because of scarcity of cell division."

I may say that this native was a raw interior black, never having visited the coast. I believe it to have been purely a native tumour, and it is the only one of that character which has come under my notice during an experience of several years in Central Africa.

NOTES OF A CASE OF SLEEPING SICKNESS FOUND ON THE HILLS, TWENTY-TWO MILES NORTH OF SERENJE, IN NORTH RHODESIA.

By Alexander Brown, M.B., Ch.B.
Serenje.

History.—A youth, aged about 18 years, born and brought up in Chimese's village (six miles from Dr. Livingstone's grave), left his home in 1908 and came to Serenje. There he was employed by the assistant magistrate, whom he accompanied on at least one journey to the Luangwa Valley. In 1909 he became attached to a mission whose headquarters were then at Serenje, and in the month of August of that year he went with a teacher on a journey round about his own country, viz., near Livingstone's grave. In August of 1910 he accompanied me on a journey across the Luangwa Valley to Nyassaland, travelling *via* Serenje, Kakumbi, and Fort Jameson. I cannot remember seeing "fly" on this journey, though I found them on a subsequent one when travelling the same route. In July of 1911 he made a journey direct to and from Broken Hill—a route on which there is no "fly" till near Broken Hill. In the present year he has been only a few miles from this station (Chitambo, near Serenje), and not, to my knowledge, in a "fly" area. A case with such a history occurring on the hills, at an altitude of 4,800 ft. in a fly-free area, calls for some attention.

The youth, Samuel Ngarande, came to my dispensary on April 18, complaining of his left ear. His temperature was 101·4° F., and he looked rather ill, but he was a powerful and well-built youth. His ear had been suppurating. Heart and lungs were normal. His spleen was very much enlarged. The blood was negative for malaria. I had at the time several cases of æstivo-autumnal fever and suspected his case was the same, though I could not demonstrate the parasite which was readily found in the other cases. His ear was syringed, and improved, and he did not complain of it again. He was at the same time put on malarial treatment and his general condition seemed to improve, though the fever never went away. He now insisted on returning to his work, which he did, but had to desist. He complained only of want of strength, but a tonic did not help him. As I was preparing to go on a journey I put him on to fresh quinine when just out from home. I was away almost a fortnight, and when I returned on May 19 I found him, if anything, worse. The spleen was distinctly larger. He complained of deafness, which I attributed to the quinine and which cleared when the quinine was stopped. I noticed a peculiar rough appearance on his abdomen, which on a white skin might have been a rash. I had always noted him as a heavy-eyed youth, but now his upper eyelids were distinctly puffy. His breathing was rapid. His sublingual gland was swollen. Decubitus was characteristic of sleeping sickness. A former examination of neck glands had aroused no suspicion, now they were found distinctly enlarged, but not soft. There was great tenderness over the tibiæ. There was no albumin in the urine. He complained of no pain, but merely of want of strength.

On finding that the quinine had had no effect on the fever or on the spleen I made a fresh examination of the blood. The fresh blood showed marked agglutination, but I found no trypanosomes in it. Stained specimens, however, very soon revealed the parasite. This was on May 22, a month after I had first seen him.

Remarks.—This case seems to me to present several points of interest:—

(1) The enlarged spleen which at this date (May 28) reaches to the level of the umbilicus, and the tenderness over the tibiæ.

(2) The condition of the blood. Over 400 leucocytes were counted. The nuclei of the large and small mononuclears were frequently indented. The reduction of the polymorphonuclears was great and the number of abnormal cells seemed to me to be large.

Polymorphonuclears	5	per cent.	
Large mononuclears	40	,,	
Small mononuclears	42	,,	
Transitionals...	10	,,	
Abnormal	10.5	,,	
Eosinophiles	1	,,	
Mast cells	1	,,	(nearly)

In connection with the enlarged spleen, the microscopical evidence for malaria was so scanty

that I am inclined to think that the enlargement is due to the trypanosomiasis.

(3) *The Parasite.*—It showed, as usual, variation in morphology. The most notable difference which caught the eye at once was the square posterior end. The percentage was much greater than in any cases seen previously. Eighty-seven were counted. Of these, forty-two had the posterior end square, or nearly square. Thirty-two had various forms, from a blunt-rounded to a very sharp-pointed posterior end. Thirteen were doubtful, the ends being hidden by corpuscles, &c. Some had the posterior ends of a snout form; some were angular. A short or absent flagellum, which I have seen in my previous cases, I have not observed in this. The blepharoplast was generally some distance from the posterior end, but sometimes, in the pointed variety, was quite terminal. The nucleus was generally about the middle.

(4) *The Source of Infection.*—The nearest "fly" to us is about twenty miles away. There are four possible explanations:—

(*a*) That trypanosomiasis is endemic in the blood of some people.

(*b*) That infection occurred in the Luangwa Valley. The length of time since the patient was there is against the theory of the virulence of *T. rhodesiense*, if it is that parasite. (He has not been in the Valley since 1910.)

(*c*) That he got it when travelling round his own home in 1909; but the history of the present illness is against it being of a chronic nature. If it is *T. rhodesiense* the same argument holds against. If it is *T. gambiense* there may be a focus of infection in that region, viz., near Livingstone's grave.

(*d*) That he has been infected here.

Against I will only say that biting flies are conspicuous by their absence almost all the year round. But biting flies like *Stomoxys* can always be found at the cattle kraal.

For a carrier of the infection here, there are, in addition to the stomoxys, bugs, ticks, and cockroaches, &c., as possibilities.

For a possible source of infection we have the following:—

(1) A dog was kept here for some days which had contracted trypanosomiasis when crossing the Luangwa Valley. When this was suspected and discovered the dog was killed. This was in 1910. I have re-examined the trypanosome of the dog and find *no* resemblance in the parasite to that in the present case. It is extremely improbable that this has anything to do with the present case.

(2) The hut in which the boy was living until a few months ago is close to a cattle kraal. The cattle, however, have never shown any sign of sickness, apart from being off colour now and again for a day or so.

(3) Several individuals have died of sleeping sickness on this station. One or two of these at first slept on the station (one, a European, in my own bed for a week) until huts could be built for them some distance away. The last sleeping sickness case died in September, 1911. This present case has never slept in any of the huts in which these lay.

TREATMENT OF SOME CASES OF HUMAN TRYPANOSOMIASIS BY SALVARSAN AND NEO-SALVARSAN.*

By Professor Ayres Kopke.

Tropical Medical School, Lisbon.

In his first works on the treatment of sleeping sickness by atoxyl, presented to the Fifteenth International Medical Congress in Lisbon in April, 1906, Kopke called attention to the fact that trypanosomes having invaded the cerebrospinal fluid remained there, notwithstanding the use of atoxyl in doses of 1½ grm. in each injection, and repeated several times.

Subsequent investigations have confirmed his ideas. In his account at the Congress of 1909 in Budapest, he concluded, from a long study of patients, that atoxyl, even when used with other medicaments, cannot make the trypanosomes disappear from the spinal fluid, and that the patients die after a period of calm (without symptoms).

Kopke divides the patients into two classes: those who have the trypanosomes in the cerebrospinal fluid, and those who have not.

His observations show that the want of result is due to an insufficient dose of atoxyl or when the nervous injuries are irreparable.

Professors Laveran and Mesnil think it improbable that a medicament can extend into all parts of the system. Professor Kopke had also this doubt, but persisted because of the good results in the treatment of meningitis by atoxyl.

It was expedient, therefore, to find a medicament of a greater diffusibility and having a more direct anti-parasitic power which might operate in cases having flagellates in the cerebrospinal fluid.

The discovery of salvarsan by Professors Ehrlich and Hata brought the hope that it might be better than atoxyl, but neither alone nor with colouring matter can patients with trypanosomiasis be cured whose nervous centres have undergone alterations, neither does it cure all cases in the first period of infection.

Professor Kopke experimented with salvarsan in patients in whom the cerebrospinal fluid showed flagellates, using salvarsan by intravenous injections. The doses were from ·3 to ·6 grm., except in a boy of 10 years, who had a dose of ·1 and ·15 grm. The injections were repeated with eight to ten days' interval, the total number being generally three. Two patients received seven injections.

Of fifteen patients treated thus ten died. Of the five living one had two hemiplegic attacks of the right side with aphasia; the paralytic fits passed off, but the patient drags the right leg a little and speaks with difficulty; besides, he has occasional epileptiform manifestations; he seems bound to succumb

* Abstract of Paper presented at the International Medical Congress in London, August, 1913.

to the illness. Of the four left one has been without symptoms, and no trypanosomes have been found for one and a half years after treatment. It would seem that patients who have nervous symptoms, somnolence, tremblings, &c., do not show as good results with salvarsan as with atoxyl.

In another patient death followed an injection of ·6 grm. It was an advanced case, with accentuated nervous manifestations and a precarious mental state. As no favourable results were obtained with ·3 to ·5 grm., ·6 grm. were given. This was followed by increased trembling; the temperature was 40·3° C.; epileptic fits were followed by coma and death twenty-four hours after the injection.

Wilhelm Wechselmann has made a solution of neo-salvarsan (1·5 the 100) with a maximum dose of 7 c.c.

Professor Kopke tried a rather advanced case of sleeping sickness with 10 c.c. of a solution of neo-salvarsan (1·5 a 100) within the arachnoid by lumbar puncture. In a few hours afterwards the patient had trouble in the lower limbs, tremblings, and an axillary temperature of 38° C.

One patient after injections died four and a half months after infection.

Another patient had three injections of ·45 grm. of neo-salvarsan; after eleven days he had severe symptoms, and died—mad—some three months after the last injection.

As cases treated by neo-salvarsan injection, arachnoidian only, or followed by intravenous, or by intravenous alone, have not got better, it seems that the use of this medicament has been rather prejudicial. The trypanosomes did not disappear from the spinal fluid.

Conclusions.

Salvarsan used in intravenous injections does not cause the trypanosomes to disappear from the cerebrospinal fluid in patients suffering from sleeping sickness. Like atoxyl, it makes the flagellates disappear rapidly from the blood and lymphatic areas, but it seems too soon to be able to say whether this disappearance is lasting.

Injections of neo-salvarsan within the arachnoid by spinal puncture do not destroy the trypanosomes under the meninges, and are not exempt from inconveniences.

THERE are 3,213 women studying in the universities of Germany; of this total 702 are studying medicine and 17 dentistry.

OPIUM was grown in China 400 years ago. The habit of smoking opium made its way into China from Java by way of Formosa in the 17th century. In 1911, when the British Government undertook to gradually lessen the supply from India, the Indian total represented only one-seventh of the amount consumed in China.

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OCTOBER 1, 1913.

MANIFESTATION INTERNATIONALE EN L'HONNEUR DE SIR PATRICK MANSON, F.R.S., G.C.M.G.

LES magnifiques progrès réalisés, depuis moins de vingt ans, dans la connaissance des maladies des pays chauds, sont dus, pour une très grande part, à Sir Patrick Manson ou à son initiative. La création des écoles ou instituts de médecine tropicale, ces foyers si actifs et si utiles d'enseignement et de recherches, est due encore à son action bienfaisante. En ces questions, il a été un initiateur de génie.

Les soussignés, persuadés que Sir Patrick Manson a rendu à la science et à l'humanité les plus éminents services, ont pensé que l'heure était venue de témoigner à l'illustre savant anglais leur vive admiration pour son œuvre, en même temps que leur respectueuse affection pour sa personne. Ils ont voulu provoquer en son honneur une manifestation internationale, à laquelle pussent prendre part tous ceux qui connaissent ou admirent Sir Patrick; tous ceux qui ont passé par l'Ecole de Médecine tropicale de Londres, ou par les écoles et instituts similaires; tous ceux qui, sans avoir été en relations plus ou moins directes avec lui, savent cependant l'immense portée de son œuvre et désirent lui témoigner leur estime et leur reconnaissance.

Dans ce but, il est ouvert une souscription

internationale, à l'effet d'offrir à Sir Patrick une médaille d'or à son effigie. Cette médaille aura la forme d'une plaquette, mesurant environ 7 centimètres de haut sur 5 de large. Elle sera l'œuvre du Dr. Paul Richer, Membre de l'Institut et de l'Académie de Médecine, Professeur d'anatomie à l'Ecole des Beaux-Arts. Tous ceux qui connaissent le fin talent et l'élégante exécution de ce savant médecin, doublé d'un très grand artiste, peuvent être certains que son œuvre nouvelle sera digne, en tous points, de ses devancières et de Sir Patrick.

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1° Chez Mr. JAMES CANTLIE, directeur du *Journal of Tropical Medicine and Hygiene*, 140, Harley street, à Londres, W. ;

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[*Translation from the French Text.*]

INTERNATIONAL MANIFESTATION IN HONOUR OF SIR PATRICK MANSON, F.R.S., G.C.M.G.

THE magnificent progress made in less than twenty years in the knowledge of tropical diseases is due in great measure to Sir Patrick Manson, or to his initiative. The foundation of tropical medical schools or institutions, those homes of learning and energy, is also owing to his beneficent work. In these matters he showed the genius of the master.

The undersigned, convinced that Sir Patrick Manson has rendered the most eminent services to science and humanity, think that the time has come to prove to this illustrious British genius their great admiration for his work and their respectful affection for himself.

They desire to promote in his honour an international manifestation, in which those who have known and admired Sir Patrick can take part; also those who have passed through the medical schools of London, or other similar institutions, and those who, without being closely connected with him, yet knowing the immense importance of his work, may desire to show their esteem and gratitude.

For this purpose an international subscription has been started, with the intention of presenting Sir Patrick Manson with a gold medal bearing his effigy. The medal will have the form of a plaque, measuring about 7 × 5 cm. It will be the work of Dr. Paul Richer, Member of the Institute and Academy of Medicine, Professor of Anatomy at the Ecole des Beaux-Arts. Everyone is acquainted with the talents and elegant work of this learned doctor and great artist. It is certain that this new undertaking will be worthy in every respect of its predecessors and of Sir Patrick Manson.

Subscriptions will be received by :—

(1) Mr. James Cantlie, Director of THE JOURNAL OF TROPICAL MEDICINE AND HYGIENE, 140, Harley Street, London.

(2) Messieurs Asselin and Houzeau, Editors of the *Archives de Parasitologie*, Place de l'Ecole de Médecine, Paris.

Subscriptions may be sent by money or postal orders, or cheque. There is no fixed sum.

As many subscriptions will come from abroad, it is requested that subscribers write their names and addresses clearly, giving full postal instructions.

The work of Professor Paul Richer is completed, but a few months are still required for the final preparation of the medals. Nevertheless the Committee did not wish the exceptional opportunity of the International Congress in London to pass without testifying their respectful sentiments and admiration for Sir Patrick.

A bronze medal, faithfully reproducing the original design has been cast, and was presented to Sir Patrick Manson on August 11, 1913, by Professor Blanchard at the Tropical Medical Section of the Congress. The attendance was very large and the ceremony most striking.

Until the medals destined for the subscribers are cast and distributed the subscription lists will remain open and all new subscribers will be gladly received.

All subscribers of £1 (25 francs) are entitled to a bronze medal.

All subscribers of £2 (50 francs) are entitled to a silver-plated medal.

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H. ZIEMANN, Médecin d'Etat-major de la Marine allemande.

Annotations.

Coccidioidal Granuloma.—Carsons and Cummins report another case of this interesting condition in the *Journal of the American Medical Association*, July 19, 1913. Clinically the case resembled typhoid fever and was diagnosed as such. At the autopsy, however, the true nature of the case was revealed.

The patient had lived in the San Joaquin Valley and had presented no skin-lesions to account for his infection. Although tuberculin reactions were negative, he was strongly suspected of being tuberculous when he was first seen in August, 1912. Marked hoarseness was then present. Wassermann's reaction was negative. In February, 1913, he was apparently suffering from typhoid. At necropsy the lesions appeared to be those of miliary tuberculosis, the largest lesions being present in the spleen. For their size, however, the splenic lesions appeared rather firm for tuberculosis. Microscopically, there was no difficulty in demonstrating the *Oidium coccidioides* (Ophüls) in the various organs. These were most numerous in the spleen. It was unfortunate that a complete necropsy was not performed, especially to determine, if possible, the character of the early laryngeal lesion.

Round Worms simulating Appendicitis.—Kelly in the *Australasian Medical Gazette*, June 21, 1913, reports the case of a boy in whom the presence of round worms simulated appendicitis. The clinical signs present were as follows. Temperature on admission 100°, pulse 106, looking pale and ill, and complaining of pain in his belly. Tongue coated but moist, had vomited once. Bowels had been constipated for some time. Heart, lungs and urine normal. Rigidity of the right rectus muscle with a very tender spot on pressure in the appendix area. An operation for the removal of his appendix was decided on. At this the organ was easily found. It was slightly reddened, but there were no evidences of previous trouble. It was removed. As its condition could not possibly account for the acute symptoms, further examination was made, and a coil of small intestine was found to have a peculiar whip-like feel about it. This was pulled out, and was seen to be intensely congested and inflamed, and with some flakes of lymph on it. Three or four round worms could be felt, and also seen to move in it. They occupied about eight inches of the bowel, and were lying lengthwise and all together. It did not seem wise to open the bowel and remove them, nor yet to crush them, as one could not say what symptoms might follow the crushing. Had the worms been near the cæcum it would have been an easy matter to push them along and remove them at the appendix stump, but they were at least three feet away. The bowel was replaced, and the abdomen closed. Three days later, whilst still on a liquid diet, the patient was given 1gr. of santonin and 6gr. pulv. scam. co. followed in six hours by castor oil, and two round worms, each about ten inches long were passed. Two days after this, santonin was again given, and two more worms were

passed. Santonin was administered again on the sixth day, but there was no result. After this the patient gained weight, and quickly recovered.

Tropical Bubo.—In the *Australasian Medical Gazette*, May 10, 1913, Triado writes on the etiology of this condition. In the last nine years he had seen fifty cases and admits that he cannot yet give any opinion as to their etiology. The only distinctive feature he found in every case was that there had been sexual connection between aboriginal women and white men. Also, all the cases have been in white males, no cases being seen in natives. In every case the man was single, except one, and this one was living away from his wife, and admitted sexual connection with native women. In twenty-seven cases the left inguinal glands were affected, and in the remaining twenty-three the right. Thirty-seven out of fifty had had gonorrhœa on some previous occasion and of varying duration. Two cases had had both gonorrhœa and syphilis, in the past. One case was under treatment for syphilis, and had a bubo also at the time of beginning treatment. Six months later all external signs of syphilis had disappeared, but the bubo still existed, and was discharging slightly. The size of the buboes varied at time of removal up to the size of an ordinary hen's egg. Fifteen of the earlier cases were examined bacteriologically, and the results failed to show any definite distinctive micro-organism.

After removal the glands were all distinct, with distinct softening in the centre of all of them, and the more superficial ones the most softened. Periadenitis varied according to the length of time that elapsed since the beginning till their removal. All the cases had a somewhat similar clinical course. The earlier cases Triado treated symptomatically by painting with iodine, a certain amount of rest, and regulation of general health. The buboes in these cases, after varying periods from two to six months, became more painful and tender, and showed signs of softening, as also did the overlying skin. In every case the inguinal glands affected were swollen, slightly tender, but distinct from each other. Subsequently, after varying periods, the most superficial glands showed signs of softening and a tendency to burst through the skin.

In the larger buboes patients complained of tightness in the groin, and an inability to walk quite upright, without certain, though not much, pain. This pain was not noticeable if the patient walked with his leg slightly flexed on the thigh.

In five of the cases, on which Triado subsequently operated, the swelling had been in existence over twelve months; and the swelling in the period had varied in size. Sometimes during the above time the bubo was larger, and at other times smaller. In the above five cases there had been a continual discharge, and after spontaneous bursting through the skin, of small amounts of pus for over six months. Periadenitis occurred in all cases which had been in existence over two months.

The diagnosis of these buboes from syphilitic and gonorrhœal buboes offers no difficulties, their history and clinical course being quite different from gonorrhœa and syphilis.

Gonorrhœal buboes show early tendency to suppuration, and spontaneous bursting through the overlying skin if not early incised. In syphilis the bilateral distribution and the characteristic hardness of the bubo and other signs make the differential diagnosis easy. In all Triado's cases the tropical or climatic buboes were unilateral, and up to the present none have developed any bubo on the opposite side.

After the first few cases the only treatment adopted has been complete removal in one mass of the whole of the affected glands, the earlier the better, as the cavity left in the groin is smaller. Occasionally complete removal in one mass appeared too difficult, so thorough curettage was adopted. After removal the whole cavity in the groin is swabbed with pure carbolic acid. The length of time for the cavity to fill up varies, according to the size of mass removed, but never more than five weeks, and this only in the largest cavities.

The after-treatment, carried out by the patient, consists of keeping the parts well washed with soap and water, and the plugging of the cavity with gauze changed twice a day. In no case was there any after-trouble, though all the patients after the first fortnight resumed their ordinary avocations.

Reports received five years afterwards showed that the results of the operation had been perfect.

Blackwater Fever.—Lovelace, in the *Archives of Internal Medicine* (vol. ii, No. 6, June 15, 1913), writes on the etiology and treatment of blackwater fever. He bases his observations upon a study of 514 cases treated by American physicians in the hospital of the Madeira-Mamore Railway Company, Porto Velho, Brazil, between January 1, 1908, and November 27, 1912.

He considers the subject under the following headings: (1) The relation of the disease or condition to malaria; (2) its relation to a particular species of malarial parasite; (3) its relation to quinine; (4) its racial and personal incidence.

Under treatment, he discusses: (1) The results of treatment with quinine; (2) the results of treatment without quinine; (3) the general treatment of the condition, and (4) the relation of the quinine prophylaxis of malaria to blackwater fever.

After an analysis of the 514 cases the author reaches the following conclusions:—

That there exists a deplorable confusion as to the cause and treatment of blackwater fever, but as far as may be indicated by his series of cases, malarial infection stands in a direct causal relation to it.

Blackwater fever is not due to a particular species of malarial parasite.

Quinine, in large or small doses, was, in his series, an invariable antecedent of the hæmoglobinuric condition, and under no circumstances should it be given to a blackwater fever patient during the period of hæmoglobinuria, nor for several days thereafter. The effect of the paroxysm of hæmoglobinuria is itself that of a drastic, but

temporary, therapeutic agent, decimating the malarial parasites in the patient's blood much as a single intravenous injection of salvarsan decimates the spirochætes of syphilis in the lesions of that disease.

Measures which sustain the blood-pressure are urgently indicated during the period of hæmoglobinuria. Of these, normal saline solution given by the bowel, subcutaneously or intravenously, is the chief. Digitalis and caffein are of decided value.

The prophylaxis of malaria is the prophylaxis of blackwater fever.

[Workers on blackwater fever will not fail to notice that there is nothing new in the above. The old difficulties remain just as they did twelve years ago. A perusal of the past literature of the disease would be of value and instructive to those about to write upon it in the future.]

Abstract.

THE PROCEEDINGS OF THE SECOND ALL-INDIA SANITARY CONFERENCE HELD AT MADRAS, NOVEMBER 11 to 16, 1912.*

Note on Sanitation in India.

By Charles N. Mandy.

Executive Engineer, Poona Drainage and Water Supply.

Sanitation is a science but recently introduced into India, and is therefore not in a very advanced state.

Some progress has been made with urban sanitation which presents no great difficulty in carrying out, but as it entails a considerable increase in the current rate of taxation in most towns, Government has to recognize that progress must be slow and measured by the strength and character of the public opinion they have to rely on in support of sanitary measures. In India, therefore, as elsewhere, the carrying out of sanitary works is now much more a question of available expenditure than of knowledge. Rural sanitation has made no progress, in fact it barely exists, and is a question of magnitude and difficulty. As a general rule the only way to improve rural sanitation is to remove the sites and construct new villages, laid out on proper principles with protected water supplies.

The origin of sanitation dates back some seventy-five years, when an Act was passed in England, and at a later date in India, about fifty years ago, for registering births and deaths. From the statistics thus made available, it was soon made evident that the annual death-rate per thousand—the most convenient standard of expressing the general state of the public health—varied considerably in different localities and under different conditions, and the fact soon became established that the death-rate depended broadly on two sets of circumstances—circumstances such as climate, clothing, feeding, local habits and customs, and others which cannot be brought under direct control by legislation, and must always be controlled by the individual; and circumstances such as conservancy, drainage, water supply, prevention of nuisances, &c., which can be brought under legislative control. It is estimated by sanitarians, that by the adoption of proper modes of life on the part of both individuals and communities a great number of existing diseases might be abolished and the annual death-rate considerably reduced. Therefore, with this end in view, it has been found necessary to introduce sanitary legislation.

Modern sanitary legislation is based on the broad general principle that every member of a community is entitled to protection in regard to his health, which protection should be so exercised as not to interfere with the similar rights of others, nor be injurious to the community in general, and has therefore been introduced to provide for the co-operation and the combination of communities to carry out sanitary works in the general interest, requiring large outlays of capital which could not be compassed by individuals, and also to guard against the public health being endangered by the action of individuals.

The law has conferred certain well-defined duties on Municipal Boards with regard to sanitary works and the powers necessary to enable them to carry out these duties. It has also provided an effective control in these matters and enabled such control to be exercised by the public and ratepayers as well as by Government. The passing of sanitary laws, however, and the granting to a certain department the power to enforce such laws, will not ensure good public health unless the public at large supports those laws intelligently. In England very considerable trouble was experienced in introducing sanitary measures. Even at the present day numbers of convictions take place for neglect of regulations and for positive nuisances in large towns, and the people still require supervision and at times coercion to make them attend to their own best interests. In India, therefore, where the habits and prejudices of the people, their religious observances and apprehensions, and other conditions are so widely different to what obtain in England, and Europe generally, it is no wonder that sanitary reforms and works are looked upon with suspicion and distrust, and unless some palpable benefit can be realized and appreciated by these people, the introduction and carrying out of such reforms and works is a matter of much difficulty and opposition.

The majority of Municipal Boards in India are dependent on the advice of Government officials in sanitary matters, as they have with a few exceptions, no independent professional agency to assist them in the preparation of sanitary projects. In such cases, the projects are prepared by the sanitary engineers to the Local Governments, and after approval by the Sanitary Boards, submitted to the Local Governments for sanction. To make these Municipal Boards fully acquainted with the facts for which they are responsible and to stimulate them to greater efforts, it is necessary that clear periodical statements of the vital statistics of the locality should be supplied, in the fullest detail. Programmes of sanitary works should also be prepared under the chief heads of:—

* Simla: Government Central Branch Press, 1913.

(1) Conservancy, including the removal of refuse.
(2) Filling up of insanitary tanks and cesspools.
(3) Latrine accommodation and public urinals.
(4) Drainage.
(5) Water supply.
(6) The improvement of overcrowded areas and of buildings with defective lighting and ventilation.

These projects of sanitation should be carefully prepared with reference to local circumstances and the resources of the Boards concerned.

The neatness and cleanliness of the appearance of a town depend on the methods in which the conservancy is carried out and on the way in which rubbish is collected by the householders for removal by municipal carts. In many cities the rubbish is freely shot out into the street at certain hours, and the provision of the Municipal Act, with regard to the establishment of proper depôts for the deposit of rubbish by house occupiers, has become a dead-letter.

In most cases, all practical purposes will be met by providing that rubbish is to be stored outside the premises at certain hours in baskets or boxes of suitable size which require simply to be emptied into carts, which would be sent round once or twice daily for purposes of removal to either incinerators or depôts outside the city limits. In small towns with populations below 200,000, incinerators should, and are likely to be a prominent feature in municipal arrangements; but, generally, they should be worked as subsidiary to a tramway project.

Tanks and cesspools constitute one of the most serious sanitary difficulties to be met with in many cities in India. The former are generally holes filled with surface drainage of inhabited sites, and the water is more often than not used for domestic purposes, although absolutely unfit for such purposes. In many cities it will take years of persistent effort and the expenditure of large capital to fill up these tanks before the population can fully reap the benefit of sanitary works. In the meantime they should, if possible, be connected with drainage systems and drained to keep down the subsoil water level.

As regards the cesspool nuisance, the extreme injury which it inflicts on the health of the population and the vital necessity of abating that nuisance are points which should claim more attention than they do at present. The remedies which can alone avail are proper systems of sewerage with effective water supplies. Wherever such remedies have been applied, enabling the cesspools to be filled up, statistics tend to show that the death-rate has been reduced from 20 to 30 per cent.

In most cities there is a large floating population which cannot be trusted to clean their own privies, and in such situations public latrines are necessary, which can be connected with the nearest sewer, or in the absence of a sewerage system the latrines should be served by sweepers and the contents disposed of at the nearest paid depôt or trenching ground.

A proper establishment of urinals is absolutely necessary in every city, and without them it is unjust to enforce prosecution for committing nuisances which make some localities so offensive.

Every city and town should have a good system of sewers. In designing a system of sewerage it should be borne in mind that one which works well in European cities, owing to climatic and other conditions, works imperfectly or injuriously in India. The greatest difficulty in Oriental drainage lies in quarters where poor populations living in tiled huts have to be dealt with. It is impossible in these cases to prescribe either closets or expensive fittings by by-laws which cannot be enforced. In such cases public latrines and urinals are necessary. The huts should have surface drains connected with a well-flushed collecting drain, connected with the nearest sewer, and in all areas liable to receive sullage and foul water impervious pavements should be insisted upon.

A good water supply is perhaps the most important sanitary agency in India. But if real benefit is to be obtained, the source of supply must be very carefully chosen and special precautions taken to protect it. It should be out of reach of the people, and the water should be conveyed to them in pipes to prevent any possible contamination. Such special precautions are very necessary in India where the people of all classes exhibit extraordinary and perverse ingenuity in defiling their source of drinking water, by bathing, washing foul and sometimes infected clothing, and vessels, cattle, &c., at such sources.

Before embarking on a water supply, chemical, biological, and microscopical tests are necessary, but it is necessary to bear in mind that reports based on the examination of a few samples cannot be accepted, and no absolute opinion can be formed at to the true character without a large number of observations taken at different seasons of the year, accompanied by a careful examination of the site and the risks of contamination it is exposed to.

The regulation of buildings in most towns in India is utterly neglected and the sanitary state of large cities such as Bombay and Calcutta may be quoted as examples of the confusion which results from allowing people to build as they please. The chief reason why the death-rate is high in overcrowded localities appears to be that, as a general rule, they are occupied by the poorest classes unable to pay for sanitary arrangements and the difficulty of sewering or access for cleaning purposes in such localities. Except on the upper floors, a large proportion of rooms are insanitary through various causes, but chiefly through defective lighting or ventilation. The high death-rate and prevalence of epidemic diseases have naturally turned a considerable amount of public attention to the necessity of building regulations and formation of Improvement Trusts, and it is hoped that the power to veto the occupation of all ill-lighted and ill-ventilated buildings and the opening out of crowded areas, will prove an efficient remedy for the existing insanitary state of affairs in nearly every Indian city.

Wherever proper sanitary regulations have been introduced, statistics show that the death-rate has practically been reduced by from 20 to 30 per cent., and as the very important question of sanitation is now receiving increased attention from Government there is no doubt that the results of improved public health and the advancement of the standard of civilization will amply reward them for the efforts they are making in this direction.

In addition to the above interesting paper the following are also contained in the report:—

Description of the Madras City Drainage Works inspected by members of the Conference, by J. W. Madeley, Esq., M.A., M.I.C.E., M.Am.Soc.C.E., &c., Special Engineer, Corporation of Madras.

"Madras City Drainage Works." J. W. Madeley, Esq., M.A., M.I.C.E., M.Am.Soc.C.E., &c., Special Engineer, Corporation of Madras.

"The Simla Hydro-Electric Scheme." A. S. Montgomery, Esq., Sanitary Engineer, Punjab.

"Sanitary Problems in Madras." W. Hutton, Esq., A.M.I.C.E., Sanitary Engineer, Madras.

"Some Differences between English and Indian Sanitary Engineering Practice." G. B. Williams, Esq., M.I.C.E., Sanitary Engineer, Bengal.

"Note on Dust Prevention." C. L. Cox, Esq., A.M.I.C.E., City Sanitation Engineer, Colombo.

"The Prevention of Dust in Indian City Roads and Streets." E. P. Richards, Esq., M.I.C.E., M.Inst. M. & C.E., M.I., Mun., E.M.R. San. I., F.G.S., &c., Chief Engineer, Calcutta Improvement Trust.

"Experimental Sand and Mechanical Filters, King Institute, Guindy." W. Hutton, Esq., A.M.I.C.E., Sanitary Engineer, Madras.

"Madras City Water Supply." J. W. Madeley, Esq., M.A., M.I.C.E., M.Am.Soc.C.E., &c., Special Engineer, Corporation of Madras.

"The Water Supply of Conjeeveram." Hormusji Nowroji, Esq., B.E., A.M.I.C.E., Executive Engineer, Madras Waterworks.

Notes and News.

THE UNION MEDICAL COLLEGE, PEKING, CHINA.

As one goes around and sees the dire need of the people and the hopeless condition of the present native practitioner, one realizes how much good must come to China and her people as a result of the splendid effort now being made in many centres to give a medical education to numbers of her young men. This matter of medical education in China is one which is occupying the minds of many of our ablest medical missionaries, and also engaging the attention of their home Boards. All praise is due to those Mission Boards which have set their missionaries free to engage more fully in this work. The fact that these men are not working as so many separate units, but in all the large centres are uniting in their efforts to form Union Medical Schools, bids fair to secure an ultimate success which separately they could never hope for.

This union work has resulted in the establishment of the Union Medical College, Peking, China. The work there established is very much similar to work being done, as intimated, in all the large cities in China. At these schools many young, bright Chinamen are given a thorough training in practical medicine and surgery. As men cannot well treat women in China, because of social practices, work is well under way, especially at Canton, in the nature of medical colleges for Chinese women, who are trained especially in the diseases of women and children. More than this, there are in China a considerable number of foreign schooled Chinese women practising modern medicine. I personally know of two who are graduates of Ann Arbor, Michigan. They are doing a most magnificent work among the women and children, one at Kiukiang, and the other at the largest city on Lake Poo Yang. Of course, all this work is under the auspices of the medical missionaries, upon whom too much credit and praise cannot be bestowed.

The work of the Union Medical College, Peking, is of especial interest, as it is not only encouraged, but partly supported by the "Chinese Imperial Government." This distinction is shared in by but very few foreign schools. The graduates received the diploma of the Chinese Imperial Board of Education, and these diplomas were presented by the Grand Councillor. Of the most particular note is the fact that this is the first instance in history of the Chinese Government conferring a foreign degree upon any of her subjects. These facts prove the awakening of slumbering China, and give evidence of the confidence the Government places in earnest, faithful, foreign workers. More than all this, members of the Imperial household and high officials are annually received into the hospital of the college for surgical treatment. The Chinese place great faith in the foreigner's surgery. They will rarely undergo operations on the abdomen, but very readily submit to other surgical work. In the line of medicine, a general faith in foreign medicine in preference to native medicine has not yet been established in the native Chinaman.

A report of the graduation exercises which took place at Peking, Friday, April 7, 1911, is given as follows:—

"What the missionaries of 1901, gathering up the scattered remains of mission work in Peking, saw with the eye of faith, we were privileged to see in actual fact. The ceremony had been long postponed owing to the exigencies of the plague work in which nearly all the graduates were engaged. At the earnest request of the authorities, it was decided to arrange matters so that they might continue their valuable work till the end of March.

"There being no room in the college large enough to accommodate the expected guests, a spacious pavilion was erected, and was made very gay with decorations in which the flags of China, America, and England predominated.

"His Excellency Grand Councillor Na Tung, who

represented the Throne at the inauguration of the college, was again present to address the graduates and present them with their diplomas. Representatives of the various Boards and other high Chinese officials were present, and many others sent good wishes and congratulations. The International Plague Conference then in session in Mukden sent the following message:—

"'The International Plague Conference unites in congratulating the Union Medical College on the graduation of its first class of students to-day. They welcome the graduates to the membership of the medical profession, and send them their best wishes for a successful career.—SZE.'

"The various missionary bodies of the city and neighbouring cities and districts were fully represented.

"Thirteen of the teaching staff of the college were present on the platform, and made a brave show in the varied academic costumes of their respective colleges. The sixteen graduates were attired in caps and black Geneva gowns with facings of purple satin. The foreign style of headgear obscured the fact that all but three had sacrificed their queues to the needs of plague work and the growing sense of dissatisfaction with the appendage. Three of them had gone the whole way and were dressed in foreign style.

"The college diplomas were printed in English and Chinese with a border of green and gold dragons, and in the centre the Æsculapian sign over the college seal in red—the effect was quite distinctive and pleasing to the eye.

"The diploma given by the Imperial Board of Education was quite plain, stamped with the purple seal of the Board.

"Sir John Jordan, the British Minister, presided and gave an address, mentioning the difficulties encountered in the beginning of the school and its progress, congratulating the students for their good work, paid tribute to the faithful students of the college who lost their lives in the work of helping to stamp out the plague scourge which devastated Northern China during the past year, and exhorted the graduates to give their services to the rich and poor alike. He implored them to assiduously cultivate their professional skill and to make it a valuable asset in the advancement of the great Empire whose illustrious Empress laid the foundations of the Union Medical College.

"After other speakers, the American Minister, the Hon. J. S. Calhoun, followed with an eloquent tribute to the noble and self-sacrificing work done by medical men all over the world in the investigation and combating of disease, which has made it possible for men to live and work in safety in places previously devastated by yellow fever, malaria, and other diseases. He spoke of the doctors of the college and many of its students having done nobly in helping to combat the plague in Manchuria, Tientsin, Peking, and elsewhere.

"The Dean, Dr. Thomas Cochrane, made the following statement during the course of his address:—

"'We have tried to create a medical nomenclature and a medical literature in the wonderful language of this country. We are still translating books, and intend to keep our students abreast of the times by publishing a monthly medical magazine. We did not adopt the easiest method and teach our students in a foreign language.'"

Much of the school work in China is done by first teaching English and then teaching science, history and literature, &c., in English. Even where this work is conducted in the Chinese language, as it is done by many of the older men, it is comparatively an easy task compared to teaching medicine in the native tongue. The difficulty lies in the fact that in Chinese we find no equivalent for the medical terms. A medical vocabulary must be manufactured. This also for the names of drugs, and the same conditions exist largely in all teaching of science. The college already has a considerable number of works on medicine and surgery, materia medica, &c., translated and a great amount of translation work is at present under way. A Chinese medical dictionary represents a feat hardly to be imagined, but this almost insurmountable obstacle to medical college work will soon be a reality. A monthly medical journal will appear before the end of 1911.

During 1911, 103 students were in attendance at the school work. These men came from thirteen of the eighteen provinces of China, and this fact again gives evidence of the reputation and renown of the college. It must be understood that there are a considerable number of schools and hospitals attempting medical education of Chinese.

As dissection is not allowed in China, naturally the work in anatomy and surgery is somewhat crippled, but the deficiency is largely made up by the employment of excellent models and charts and clinics.

The course covers about the same work as that done at the average schools in the States, and presumes a thorough high school preliminary education.

To this college is due the discovery of the first plague case in Peking, and the work immediately started and already under way saved Peking from a devastation from plague. In fact, the recent work done by medical men in saving China from extinction by plague has done more to cause the Chinese people and Government to favour and encourage foreign medical work and general missionary enterprise than anything else in the history of the past. Also a much kindlier feeling toward all foreigners will be a direct result.

The following statement is made relative to the result of the examination:—

"In the final examination the results of the written papers and the oral tests showed a standard not lower than that attained by the average European graduate, and the Board thinks that the college authorities have every reason to be congratulated on the class of medical men it has contributed to the profession."

The final examinations were conducted by an

International Board of Medical Examiners, and at the examination officials of the Imperial Board of Education were present.

The following is the list of graduates:—

Ch'u Yung-p'ing.	Wang Chiu-te.
Hsieh En-tseng.	Hsueh Shou-yi.
Hsu Tso-ming.	Ho Sheng-ch'ang.
Wu San-yuan.	Shih Chi-yung.
Fan Fu-lin.	Ma Te-ch'ang.
Wang Huei-Ch'uan.	Tien Chih-yuan.
Liu Yi-te.	Li Yu-ch'un.
Wang Choang-ling.	Wang K'uei-shan.

The following is representative of work done at a missionary hospital in China. At the Peking Hospital, during fifty years, over 1,500,000 treatments have been given.

The statistics for 1910 are as follows:—

Out-patients.

First visits, men	13,254			
women	5,640			
		18,894		
Return visits, men	20,811			
women	8,525			
		29,336		
				48,230

In-patients.

Men	713		
Women	143		
			856
			49,086

Contributed by J. F. RUPERT, U.S.Navy,
U.S. Naval Hospital, Annapolis, Md.
Written in China,
August 15, 1911.

Drugs and Appliances.

MESSRS. OPPENHEIMER, SON AND CO., LTD., are now issuing emetine hydrochloride in the form of hypodermic tablets, each containing ¼ gr. These tablets are moulded and not compressed, a feature productive of immediate disintegration and instant solubility.

This is a highly commendable feature, since hypodermic administration is more often than not an act of emergency or else performed under circumstances in which the usual implements which facilitate solution are absent. In the treatment of amœbic dysentery and its attendant complications, emetine hydrochloride has been found to be practically a specific.

IT is, unfortunately, the fact that a large number of persons cannot take either quinine or cinchona in the ordinary forms without suffering from well-marked phenomena of cinchonism. In Vibrona this great drawback is overcome, and the combination of the hydrobromate of cinchona with the well-matured wine naturally enhances the tonic properties of the bark. Hence its particular value in cases where a low vitality has been engendered by residence in tropical climates. In short, Vibrona (which is prepared on scientific lines in laboratories constructed for the purpose, and under regular expert supervision) may be regarded as a valuable combination of stimulant, nutrient, and tonic which should prove of much value as a recuperative agent in malaria and in the convalescent stages.

Numerous medical appreciations have been received by Messrs. Fletcher, Fletcher and Co., Ltd., of London and Sydney, who make a special feature of maintaining this tonic wine as a carefully standardized preparation.

THE Clayton Fire Extinguishing and Ventilating Co., Ltd., have been awarded a Grand Prix for their exhibit of one of their fumigating and disinfecting machines at the Ghent Exhibition.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"The Journal of the American Medical Association," August 9, 1913.

Salvarsan in Dysentery.—Wadhams and Hill report three cases of amœbic dysentery treated with salvarsan. Improvement seemed to result from the employment of the drug. The authors are quite right, however, when they say that basing deductions on insufficient evidence and forming definite conclusions which take into consideration but few cases is a dangerous tendency which each year is being more widely realized. So many unreported factors may be concerned with so-called cures that until large numbers of observations have been made it is hazardous to attempt a scientific report on a small number of cases.

"British Medical Journal," August 16, 1913.

The Bionomics of the Rat-flea.—Strickland replies in a letter to some criticisms made upon a statement of his as regards the longevity of the rat-flea when fasting. Bacot, who made these, seems to doubt the accuracy of the times mentioned. A point, which Strickland believes absolutely proves his original statement, is that he found *Trypanosoma lewisi* in several of the fleas, these being derived from the rats on which he had fed them eighteen months or more before.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

SOME EXPERIENCES OF MOUNTAIN SICKNESS IN THE ANDES.

By T. H. Ravenhill, M.B., B.C.

Late Surgeon to the Poderosa Mining Co., Ltd., Chile, and to La Compañia Minera de Collahuasi, Chile.

In the following paper I have tried to present certain facts which came under my observation while acting as Medical Officer to a mining district in the Andes, and though I have brought forward no theories I have ventured to suggest one or two ideas which seemed to be consistent with the conditions that I found obtaining at the altitude named.

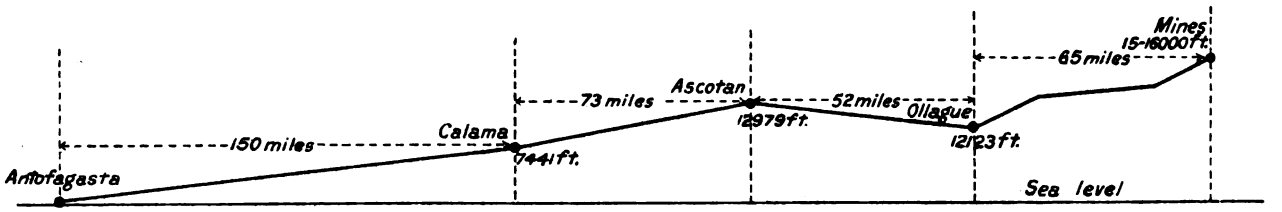
The condition of mountain sickness, known generally as Puna in Bolivia, and as Soroche in Peru, is very common in the district I am about to describe. These names are given to a train of symptoms which affect the new arrival at high altitudes and which tend to pass away as he accustoms himself to his altered surroundings. As investigated by explorers and mountain climbers the subject has of necessity been complicated by the elements of fatigue, insufficient food, &c. The district in which I have been able to observe this condition for a period of two years is a mining region in the Andes, close to the Bolivian frontier of Chile, situated at a height of from 15,400 ft. to 16,200 ft. The district is served by a railway, and it is by this means that the majority of newcomers have arrived at the mines. This has given me an opportunity of observing the effect of altitude uncomplicated, or nearly so, by the elements above stated.

The term " Puna " is used in rather a loose way by the inhabitants in these altitudes, who use the word not only to express the illness with which most people suffer on arrival, but also for the dyspnœa on exertion which affects everybody who lives there, no matter how long he has been in the altitudes. In the following article the term is used in its former—and proper—sense.

The journey to the mines begins at Antofagasta, a seaport on the Pacific Ocean, the railway running first of all over the great desert of Atacama and rising gradually the whole way to Calama, situated at a height of 7,441 ft., and about 150 miles from Antofagasta. If the passenger has decided to make the journey slowly he will stay the night here, continuing the next day; if, however, as is more usual, he travels by the luxuriously equipped " Nocturno," or night train, he arrives at Calama in the early morning and proceeds in the same train. From Calama the line still rises to Ascotan, 223 miles from Antofagasta, situated at a height of 12,979 ft.—the highest point of the main line. This latter fact is announced by a notice at the side of the line, and it is commonly supposed that a number of cases of mountain sickness begin here, induced by the sight of this notice in persons possessed of too vivid an imagination.

From Ascotan the line descends to Ollague, on the Bolivian frontier, 12,123 ft. high and 275 miles from Antofagasta. Ollague is reached in the afternoon, and from here the main line is left, a branch line taking the passenger to the mines. He leaves in the early morning of the next day, the mines being reached about midday—forty-two hours after leaving Antofagasta if the passenger has come by the fast Nocturno, or two and a half days if he has travelled by ordinary trains.

Below is a rough diagram of the route.



Puna of a Normal Type.

Symptoms.—It is a curious fact that the symptoms of puna do not usually evince themselves at once. The majority of newcomers have expressed themselves as being quite well on first arrival. As a rule, towards the evening the patient begins to feel rather slack and disinclined for exertion. He goes to bed, but has a restless and troubled night, and wakes up next morning with a severe frontal headache. There may be vomiting, frequently there is a sense of oppression in the chest, but there is rarely any respiratory distress or alteration in the normal rate of breathing so long as the patient is at rest. The patient may feel slightly giddy on rising from bed, and any attempt at exertion increases the headache, which is nearly always confined to the frontal region.

On examination the face may be slightly cyanosed; the eyes look dull and heavy, with a tendency to water; the tongue is furred. The pulse is nearly always high, being generally in the neighbourhood of 100 or over. 150 was the highest in my cases. The temperature is normal or slightly under; not often is there any rise of temperature at first, though it may rise towards evening.* There is at times reduplication of the pulmonary second sound. The patient feels cold and shivery.

The headache increases towards evening, so also does the pulse-rate; all appetite is lost, and the

* Residents at these altitudes have, in health, a slightly subnormal temperature.

patient wishes to be left alone—to sleep if possible. Generally, during the second night he is able to do so, and as a rule wakes next morning feeling better; the pulse-rate has probably dropped to about 90; the headache is only slight. As the day draws on he probably feels worse again, the symptoms all tending to reappear on any exertion; if, however, he keeps to his bed, by the fourth day after arrival he is probably very much better, and at the end of a week is quite fit again.

The most prominent feature in this type of puna is frontal headache and extreme lassitude. I have said nothing of epistaxis or other hæmorrhages, dyspnœa, or extreme vertigo. These and other symptoms, however, may all be associated with puna, and may be so serious and pronounced as to obscure altogether the usual type of attack, which I have ventured to call the normal type, and which is not a very serious condition at the altitude in question.

There are also wide divergencies from this normal type, and in my experience these divergent types of the disease may be conveniently grouped into two classes:—

(1) Those in which cardiac symptoms, and (2) those in which nervous symptoms predominate.

Puna of a Cardiac Type

Marked cardiac cases were not common. One of the worst that I had was the following:—

An Englishman, Mr. V., visited the district in February, 1911. The weather was snowy and damp. He arrived in the usual way, by train—forty-two hours' journey from sea-level. Three years before he had lived at the same mine for a period of three months, had not been ill on arrival, and had been in good health the whole time. For some time previous to this latter visit he had been in the altitudes of Peru, attaining a height of 17,000 ft., and had not been affected. He seemed in good health on arrival, and said that he felt quite well, but nevertheless he kept quiet, ate sparingly, and went to bed early. He woke next morning feeling ill, with symptoms of the normal type of puna.

As the day drew on he began to feel very ill indeed. In the afternoon his pulse-rate was 144, respirations 40. Later in the evening he became very cyanosed, had acute dyspnœa, and evident air hunger, all the extraordinary muscles of respiration being called into play. The heart sounds were very faint, the pulse irregular and of small tension. He seemed to present a typical picture of a failing heart. This condition persisted during the night; he coughed up with difficulty. He vomited at intervals. This condition persisted during the night; he had several inhalations of oxygen; strychnine and digitalis also were given. Towards morning he recovered slightly, and as there was luckily a train going down to Antofagasta in the early morning, he was sent straight down.

I heard that when he got down to 12,000 ft. he was considerably better, and at 7,000 ft. he was nearly well. It seemed to me that he would have died had he stayed in the altitudes for another day.

The point about this case is the acute heart condition coming on in a perfectly healthy man; a man, moreover, who had lived in the same place before and without harm, who had been also in the altitudes of Peru not long beforehand. In addition to this he was quite well the first day, and had done nothing liable to bring on such an acute attack. Of the weather conditions in which he arrived more will be said later.

Another case of what I think must have been cardiac puna occurred in a neighbouring mine. A young policeman rode up to the district from the coast (Iquique), a three days' journey. On arrival he was said to be markedly collapsed and dyspnœic. He was sent down at once on a stretcher, carried by relays of Indians, but he died at 11,000 ft. on the way down. I did not see the case at all, as I was never summoned. In this instance we have the element of fatigue superadded, as he had had a nine hours' journey on horseback.

I had a third case of this nature on July 19, 1911. I was called to see a young Turk, aged 23. He was a well-made man, with no previous history of illness, and had lived in the district for some months before. He had been below in the port for some weeks, and arrived again in the district on July 14 late in the day. On the 15th he was getting about, though he had a slight headache; on the 16th his headache had increased considerably. The next day he was really ill, according to his friends' account, and gradually got worse till the 19th, when I was called to see him.

On examination he was profoundly dyspnœic, respirations being 60, pulse 144, and hardly perceptible. Air hunger was extreme, he had frequent shivering fits, and the extremities were icy-cold. The face was pallid save for the lips and ears, which were cyanosed. The tongue was very dry, and covered with a white fur.

The heart sounds were all weak. There were a few râles to be heard at both bases.

During the night he became unconscious while making several efforts to get out of bed, and in the morning he was obviously dying. Death occurred about 2 p.m.

The history of this case was interesting in that he was evidently suffering from the normal type of puna at first, which afterwards developed into a cardiac attack. Like the first case, he had lived in the altitudes before. I feel sure that he could have been saved by being sent down earlier, but from the time when I was first called to see him there was no hope of recovery, and he was practically dead before the next train came along.

These three cases all occurred in young men, two of whom I knew to be healthy beforehand, and the third had a healthy history; these cases were the worst I saw.

On the other hand, a great many people with weak or diseased hearts would fail to show cardiac symptoms. I remember a case of a woman with a large aortic aneurism. She had slight dyspnœa, but complained chiefly of headache and profound prostration. She was sent down at once.

Puna of a Nervous Type.

In this type of puna the nervous symptoms are most prominent. It is a rare divergence from the normal.

In its simplest form it consists of a feeling of nervous excitation and buoyancy; it has been described to me as a sense of being lifted into the air as by a balloon. It may precede an attack of the ordinary type. There may be a tendency to twitching of the lips and trembling of the limbs. Generally it passes off, but the nervous symptoms may develop to such a degree as to become alarming.

The most marked case I had was a young Chileno, aged 19. He arrived at the neighbouring mine in the usual way; three days later I was called to see him. He was then unable to speak, there were violent spasmodic movements of the limbs, and he resisted examination. The face was blanched, the lips almost white, the pupils slightly dilated. Temperature and respiration were normal; the pulse 140. He was unable to stand or walk. I was told that he had been in this condition almost since his arrival, and that he had been delirious, talking all sorts of nonsense. I could find nothing organically wrong on physical examination. He was sent down the same day; three days later, *i.e.*, by the time he had reached the coast, he had quite recovered.

Just before I arrived in the district there had been another case of this nature. The case was described to me as being practically the same, except that the patient—a young Englishman—had marked convulsions. He also recovered on being sent down, and on recovery had no recollection of having been in the place at all.

It may not be out of place here, though not coming exactly under this heading, to mention a case under my care in which a typical attack of delirium tremens was brought on by the altitude. The patient had had a comfortable journey up, and had not been exposed unduly to cold. On arrival he went to his room and took no alcohol. The attack began two days later, and on the third day he presented a typical picture of delirium tremens, when he was sent down.

Vertigo may be a prominent symptom, though it is rarely very pronounced. I had one very marked case in a young Chileno. When lying or sitting in bed he was quite fit, and made several attempts to start work in consequence. As soon as he got up, he was so violently giddy that he had to get back into bed. This condition lasted for three weeks, getting slightly worse, and he was then sent down. A careful physical examination yielded no evidence of any organic mischief, and he had a good previous history. The only other case I saw in which vertigo persisted to a marked extent was in an Englishman of 40, with whom it lasted for a week. The pulse was not good, however, and the heart sounds were weak.

These are, so far as I have found, the two chief divergencies from the normal type of puna. There are two other symptoms usually understood to be associated with mountain sickness—vomiting and epistaxis.

Vomiting occurred in about half the cases. It was never serious, and soon passed off.

Epistaxis was not common. It occurred in about 20 per cent. of the cases, and was hardly ever very profuse. An interesting case was that of a priest of 34, who had been in the district two months previously without suffering from the effects of the altitude. On his second visit he developed a most profuse epistaxis, and had to go down again to a lower level (8,000 ft.), where it stopped. On first going to the district, on my way up I met an elderly man who told me that he had once visited the place, but that he had come down immediately, bleeding—according to his account—not only from the nose, but from every mucous membrane of which he was possessed. In this connection it is an interesting fact that while epistaxis was not common, and still more rarely profuse on first arriving at the altitudes, it was a fairly common symptom with all those who were living there when they became ill, especially with any febrile condition.

My own personal experience of puna was practically limited to one attack. On my first arrival, after a long sea voyage, I did not feel anything except a slight headache on the first morning, which quickly passed off. It should be mentioned that I took four and a half days to make the journey from sea-level. After living in the district for eighteen months, I spent a month at ordinary levels. On returning from the coast in the ordinary way I felt perfectly well—pulse about 75, as against my average of 65 on the coast. I went about the mine, however, instead of keeping quiet. During the night I could not sleep, and had a severe feeling of pressure in the chest, especially in the precordial region. The pulse during the night was about 130. The respirations were increased, and I could not take a deep breath. The headache was only slight, and was soon relieved by aspirin. There was no vomiting. The next day I gradually got better, and was quite fit by the third day. I fancy this attack was of the cardiac type.

It will be seen by the foregoing that the effects of an altitude of 15,000 ft. vary greatly and are difficult to reconcile. Some people escape altogether, and some who do not suffer on their first visit may be very ill on their second.

There is, in my experience, no type of man of whom one can say that he will, or will not, suffer from puna. Most of the cases I have instanced were men to all appearances perfectly sound. Young, strong, and healthy men may be completely overcome; stout, plethoric individuals of the chronic bronchitic type may not even have a headache. I have known several instances of this, even when the persons in question have taken no care of themselves.

Influence of Weather Conditions on Puna.

The weather in the district is of three fairly distinct kinds. In the months of January, February,

and March it is stormy, and there may be snow, thunder, and hailstorms any day or every day, with lightning striking the ground in all directions and the sky overcast with thunder-clouds. From April to September the weather is usually much colder, with strong winds and a clear sky. It is during this period that the district is liable to be visited by very severe blizzards, which cover everything with deep snow and render the avocations of life very difficult. The thermometer goes down to well below zero C. each day. October, November, and December are usually good months, not too cold, with clear sky and gentle breezes.

During the first part of the year, *i.e.*, in the thunderstorm period, puna, in my experience, is always at its worst. Most of the bad cases occurred during this season, and this, I think, is what is generally found all over the altitudes of this part of the world. I think that the reason that puna is at its worst during this season is to be found in the diminished vitality of the body, and the consequent lessened power of resistance which this sort of weather causes anywhere. During this period nobody feels at his best, however long he has been in the altitudes. Dyspnœa on exertion, minor illnesses, lassitude, were all more common with us, and the same influences which affected us would certainly act on a newcomer.

During the second portion of the year—the cold portion—puna is less severe than at any other time. It frequently happens, in this season, that a man escapes altogether; and the period corresponds to that in which most of the residents feel at their best. These remarks do not apply in the case of blizzards, but there is practically no puna during a blizzard, for the simple reason that it is impossible for a newcomer to get to the district at all.

During the third part of the year—the warmer part—puna is rather worse than during the second part. In this season the winds are much less strong, and we frequently had a day with no wind at all. I noticed that on windless days cases of puna began sooner and were rather worse; this again corresponded with the condition of those living at the mine—everyone felt slack, and less inclined for exertion on still days than when a slight breeze was blowing.

The best day for arriving at the altitudes is a clear, cold, dry day with a fair breeze. The worst day is the day of snow or hailstorms, with thunder and the sky overcast. In effect, this is merely an expression of the influence of weather on the bodily condition of a man wherever he may be.

Influence of Alcohol.

Alcohol plays a distinct part in accelerating an attack and increasing the severity of the symptoms. If a man takes much alcohol on his journey to the heights he nearly always suffers more than the abstemious man. Habitual alcoholics, however, are not necessarily attacked more severely, provided they do not indulge too freely on the journey. Total abstainers, on the other hand, are not by any means exempt.

Influence of Muscular Work.

Physical exertion also renders a man more susceptible to an attack. Although most people kept quiet for the first day or two, puna or no puna, there were some who, feeling quite well on the first day, were inclined to scoff at precautions and would exert themselves in the ordinary way, and this nearly always meant that they were in bed the day after.

Influence of Tobacco.

I frequently heard that it was a bad thing to smoke on the journey to the altitudes. So far as I could ascertain, in habitual smokers tobacco exerted no influence either one way or the other. Most people smoked sparingly or not at all on first arrival, not only because they probably felt ill, but also for the reason that tobacco, at this altitude, does not burn so readily as at normal levels, and it requires a little practice before one can enjoy it again.

Sex and Age.

It was difficult to form an opinion with regard to the influence of sex in puna. The females belonging to the families of the ordinary workpeople did not commonly seek medical advice excepting for severe attacks, and those of a higher station in life who came to the mine were very few. I think, however, that on the whole women suffered less than men.

With regard to age, children under 15 years of age were less affected than their elders. I do not remember seeing a really bad case in a child. It should be mentioned that a great many of the workpeople were Bolivian Indians who were born at an altitude of about 12,000 ft. The Indian does not suffer, as a rule, from the effects of the altitude with which I am dealing. The children who came to the mines from the coast were fewer in number.

Above the age of 15 or thereabouts there appears to be no rule to govern the liability to an attack. Young or old suffered or escaped indiscriminately.

Treatment of Puna.

The treatment of the normal type resolved itself into rest in bed with the window well open, even for very slight cases, and at least a day of quiet after all symptoms had disappeared. I found that aspirin, in doses of 1 grm. to begin with, and 0.5 grm. every four hours afterwards, was of immense value for the headache, there being an almost invariable relief after the first dose. Phenacetin I tried a few times, but the benefit obtained was not nearly so marked; this, I think, may be attributed to its depressing effect on the heart. I got, with aspirin, such excellent results in the intense headache of puna that I was not tempted to try other drugs for this symptom.

For the rest, light diet and attention to the bowels were usually all that was necessary, though, as a

rule, nothing very drastic in the way of a purge was given, experience showing that free purgation was not beneficial. In the bad cases, including those that developed cardiac or nervous symptoms, the only thing to be done was to treat the conditions as they arose as well as possible under the circumstances, and to send the patients down again as soon as possible.

There are several herbs in which the Indians of Bolivia and Peru have great faith for the relief of puna. Of these, "Chacha Como" and "Flor de Puna" are the most used, usually in the form of an infusion. Also a herb called "Huamanripu," which I heard of when I was in Peru. This was given to my informant at a height of over 18,000 ft. on a mountain called Sarjantay, in Peru. He told me that at this height he was seized with profuse bleeding from the nose and vomiting, and that the symptoms stopped immediately after chewing a little of this herb, given to him by an Indian. I cannot help thinking that this was a case of *post hoc*, and not *propter hoc*.

I once or twice watched the effect of the two first-mentioned drugs, but could not find that there was any relief after their use.

I gave oxygen in several cases of puna, but did not find that it had much effect. One patient said that his headache was better after each inhalation, but I think that expectation of relief had in his case something to do with the improvement. For one thing I had a very imperfect apparatus, and had to make my own oxygen by heating a mixture of $KClO_3$ and MnO_2. I think that possibly I might have obtained better results with a proper apparatus for continued administration and with pure oxygen. But the difficulty and expense of obtaining these in the Andes are, I think, sufficiently obvious.

If the symptoms of puna, however, are solely the result of lack of oxygen in the inspired air, it appears to me that the routine administration of oxygen would only serve to bring the patient—so to speak—back again to lower levels, and that the symptoms would reappear when the administrations were stopped. Nor would the gradual diminution in the amount of oxygen given procure the desired effect. The patient, in his ascent, has already undergone this diminution from the normal, and very much more gradually than one could conveniently bring it about in the administrations. I think that if oxygen, given under proper conditions, does do good in puna, its use will probably be confined to dangerous cases, to tide over the time till the patient is able to descend to normal levels.

I gave during the night several inhalations of oxygen to the first of the bad heart cases described above. It did not seem to afford him any relief at all.

The Question of Acclimatization.

It is obvious from the cases of puna that I have quoted that the fact that a man has lived in the altitudes does not mean that he is immune from their effects when he revisits them. The question arises: is there any tendency to acclimatization, and can a person, by prolonged residence at a certain altitude, render himself immune to the effects of a much higher altitude than the one to which he is accustomed? A number of experiences bearing on this point may first be cited.

Three members of the staff of one of the mines, the length of their residence at 15,400 ft. varying from one to one and a half years, made at various times explorations on a neighbouring volcano 18,000 ft. high, and in one instance slept not far from the summit. One resident at 12,000 ft. also made the ascent on several occasions. The ascent, an easy one in point of steepness, is made on mule-back. None of them suffered in any way from puna, though the first three had all been affected by it on first arrival at the mine level. It should be noted that they were all *carried* up on mules. Incidentally, these were not more distressed than usual.

Mr. B., an Englishman, aged 32, paid a visit to the mine level eleven times in the two years of my stay there. Of these nine visits were made direct from the sea coast, and two from Bolivia, at an altitude of 12,000 ft. On each of the nine occasions on which he came straight up from port he suffered from puna. On the two occasions on which he had already been for some time in the heights he once escaped altogether, and the other time he had a very slight attack indeed.

Mr. M., a strong and healthy Englishman, aged about 42, has the following record: On first visiting the mine, three years ago, he suffered so badly from puna that he went down again. On his next arrival, a year later, when he came to reside at the mine, he again had a bad attack which lasted for about a week. During his first year at the mine he made several descents to port, with corresponding re-ascents, doing the whole trip in about a week—at each re-ascent he had a very slight attack of puna. After a year at the mine he contracted enteric fever in port, and was away for about three months. He made a good recovery, and felt in the best of health at the end of his convalescence. He then made the ascent to the mine again, and was laid up with a bad attack of puna for over a week. Later he went into Bolivia (12,000 ft.) for about ten days; on re-arrival, no puna.

Mr. S., an Englishman, aged 38, suffered from puna on his first arrival. After a year in the altitudes without going down he went away for a month. On his return he had a well-marked attack of puna. Six weeks later he went down to the coast, and returned five days afterwards—no puna.

Mr. L., an American, aged 26, suffered from puna on his first arrival. After six months without going down he went to the coast, and returned in five days' time—no puna.

Mr. S., an American, aged 26. On first arrival from the States he had a bad attack of puna. After some months without going down he went to the coast, coming back within five days—no puna. After nineteen months he went away for a month, never getting lower than 8,000 ft. On return—no puna.

These few cases illustrate a very common state of affairs, which may be summarized as follows:—

(1) A certain amount of acclimatization to puna is conferred on those who live at 15,000 to 16,000 ft.

(2) This acclimatization tends to protect them when reaching a higher altitude than the one in which they live.

(3) The acclimatization also tends to protect them on their *return from* lower levels. Immunity from puna is the rule for an indefinite period of time for descents of 3,000 to 4,000 ft.; it is enjoyed after descents to sea-level, provided that only a few days elapse between the departure from and return to the altitude.

(4) This acclimatization wears off after a sojourn of any length at normal levels, leaving a man just as prone to an attack as one who has never been in the altitudes. What length of time is needed for it to wear away I cannot say, but I think that acclimatization is generally lost after about ten days at sea-level.

The acclimatization mentioned above does not hold good for everyone, and the above statements are not intended to be taken as rules, but as probabilities. It must also be understood that they only apply in cases where no violent physical exertion is undertaken in the ascent; the cases instanced, for example, all being those in which men were carried in some way or other.

If the factor of fatigue is introduced, quite another set of conditions comes into play. Residence at an altitude of 15,400 ft., though it may confer a certain amount of acclimatization to the effects of altitude as far as this alone is concerned, certainly does not render a man less liable to the effects of fatigue at that altitude; rather the reverse. My experience, and that of most of my fellow-residents, was that the longer a man lived at a height of 15,400 ft. the less capable he became of resisting fatigue there; most of us who had lived there for any length of time lost weight; dyspnœa on exertion—in going uphill, for instance—always troubled us; it became more common for us to have minor illnesses. Possibly the dyspnœa on exertion was a little less; at the end of two years I do not think I felt the effects of walking uphill quite so much, but it was always there; and any excessive exertion would often cause us to have symptoms much resembling the puna with which we suffered on first arrival. The subject of physical exertion at high altitudes, apart from its effects on puna, is rather outside the scope of this article. The point, however, that I wish to emphasize is this, that a man who had lived for some time at a certain height, say, 15,000 ft., and who was *carried* from this to another point much higher, say, 20,000 ft., would in all probability feel the effect of the diminished pressure very little, and in any case very much less than a man who had lived at ordinary altitudes and was *carried* to that height from sea-level; but, other things being equal, he could not *climb* to that height nearly so well as the man who was accustomed to ordinary altitudes.

Effect of Slow or Rapid Ascent.

Connected with the subject of acclimatization is the question of the effect of slow or rapid ascent. As a rule, persons coming to the district usually availed themselves of the fast and comfortable "Nocturno," instead of performing the journey in stages. The workpeople generally came from the port by the day train, which would get them up in two and a half days. When a man took longer over the journey—say, a week—he suffered, as a rule, less from puna than those who came up quickly. On a certain railway in Peru, which reaches a height of nearly 15,000 ft. in a few hours, I am told that puna frequently presents itself in much more alarming forms than it does on our line, epistaxis being very common. Very rarely did hæmorrhages occur during the actual journey in our case, and I think that this was due, to some extent, to the fact that it was necesary for everyone (excepting in rare instances where a special train was chartered) to spend a night at 12,000 ft.

Puna more Common in Certain Places.

It is a well-known fact that in the Andes puna is worse in certain places than in others of the same, or nearly the same, altitude. For instance, in La Paz, in Bolivia, which is situated at an altitude of 11,965 ft. above sea-level, puna is much more common than on the high Bolivian Plateau, which is 12,100 ft. on an average. Perhaps the influences, previously mentioned, of climate and muscular work account in some degree for this. La Paz is a city of steep gradients up which a newcomer has to walk; the Bolivian Plateau is flat; moreover, the air movement in the streets of La Paz, lying as it does in a hollow, is very much less than on the windswept plateau. In other cases, however, in which this condition obtains the differences between the places are not so marked, so that this cannot be the complete explanation. This condition is merely stated here as an interesting fact. There are, indeed, certain valleys in the Cordillera known as "puna valleys" from this circumstance.

Effect of Regaining Normal Levels.

In view of the fact that certain symptoms may be expected when a man ascends to an altitude such as I have been dealing with, it is not unreasonable to suppose that, after living at this altitude for some time, he would feel some effects on once more regaining a normal elevation, apart, of course, from the greater capacity for muscular exertion. Such is not usually the case, but I have heard of men being affected by slight headaches and tinnitus.

I myself twice went down to sea-level. In the first instance, after eighteen months in the altitudes, I descended on mule-back, taking three days over the journey. On the third day I was conscious of a very slight feeling as though I had a partially obstructed Eustachian tube, which soon passed off. The second time I stayed for three weeks at an altitude of between 11,000 and 12,000 ft., in Bolivia

and Peru. I then went down to sea-level by train, doing the journey from 12,000 ft. in twelve hours, and attaining on the way an altitude of 14,666 ft. At a height of about 3,000 ft. I began to be troubled with the same sensation in the right ear, and this became quite painful during the same night. The pain lasted for the whole of the next day, and then

The effect of descent upon the pulse-rate may here be noted. The pulse-rate increases on arrival at the altitudes, remains higher than normal during residence there, and appears to diminish simultaneously upon descending. My pulse-rate, at rest, for 15,400 ft. was always about 75 to 80. Usually, for ordinary levels, it is 65 to 70. It fell to

No.	Previous experience of heights above 10,000 ft.	Age	Sex	Vomiting	Headache	Bleeding	Respirations at rest	Pulse	Temperature. Degrees
1	None	24	M.	Present	Frontal	None	Normal	96	98·4
2	,, ...	27	M.	None	Slight frontal	,,	,,	90	98·4
3	Once before 12,000 ft.	36	M.	Slight	Frontal	A little from nose	,,	114	98·4
4	None	35	F.	None	,,	None	,,	104	98·4
5	,, ...	40	M.	,,	,,	,,	—	—	—
6	,, ...	30	M.	A little	,,	,,	40	104	—
7	Living at mine. Return after leave of absence	Young man	M.	None	,,	,,	Normal	110	102
8	None	28	M.	,,	,,	Slight from nose, second day	,,	96	98·4
9	,, ...	24	M.	,,	Occipital	None	,,	102	100
10	,, ...	32	F.	A little	Frontal and occipital	,,	42	128	98·4
11	,, ...	30	M.	Present	Frontal	From nose	24	96	99·8
12	,, ...	8	M.	,,	,,	None	30	150	101
13	,, ...	35	M.	None	,,	,,	Normal	110	98·4
14	Born here	2	M.	,,	Evident	,,	,,	96	99
15	At mine some time before ...	35	F.	Very slight	Frontal	From nose very slight	24	104	98
16	None	40	M.	None	,,	None	Normal	104	100
17	,, ...	19	M.	,,	,,	,,	,,	144	98·4
18	At mine a year before	16	F.	Present	,,	,,	24	120	97·6
19	In Peru	33	M.	,,	Occipital	,,	Normal	66	97·8
20	None	28	M	None	Frontal	Very slight from nose	,,	100	98·4
21	Over a year in mine	42	M.	,,	,,	None	,,	96	98·4
22	Was in the mine before for three years	25	M.	,,	,,	,,	,,	108	98·6
23	Once before 14,000 ft.	55	M.	,,	,,	,,	,,	108	98·2
24	None	25	M.	Present	,,	Slight from nose	,,	108	99·4
25	,, ...	26	M.	None	,,	None	,,	104	98·0
26	,, ...	26	M.	Present	Frontal and occipital	,,	,,	84	99·2
27	Lived here before	About 30	M.	,,	Frontal	,,	40	144	—
28	None	35	M.	None	,,	,,	Normal	—	—
29	,, ...	35	M.	A little	,,	,,	,,	120	98·6
30	Lived here before	18	M.	None	,,	,,	,,	108	97·8
31	14,000 ft. and 12,000 ft. ...	32	M.	,,	,,	,,	,,	120	97·6
32	Here before or two years ...	40	M.	Present	,,	,,	36	90	98·0
33	At 10,000 ft.f	42	M.	None	,,	Very slight from nose	Normal	102	98
34	None	24	M.	Slight	,,	None	,,	104	98·6
35	,, ...	27	M.	,,	,,	Slight from nose	,,	102	98·4
36	,, ...	16	M.	Present	,,	None	,,	102	98·4
37	,, ...	40	M.	None	,,	,,	,,	—	—
38	Living here; return after a month at sea level	29	M.	,,	,,	,,	30	120	98·4

disappeared. I have never suffered from any ear affection before or since.

One man I met, who descended to sea-level rapidly after a lengthy sojourn at 12,000 ft. and who was very deaf, attributed his deafness to the rapid journey, assuring me that it began on his journey down. This was the only case of the kind that I heard of.

about this rate after my first descent from the mine to ordinary levels.

During my second descent it was as follows:—

After three weeks at 11,500 ft., taken at intervals, its average was 72.

Then, on my journey to sea-level, on the highest point of the journey (14,666 ft.), it was still 72.

But at sea-level, eight hours from this point, it

was 60. Two hours later it was also 60. Afterwards it rose to the normal rate—65 to 70.

NOTE.—Later on in Mexico, at 8,036 ft., it was 78. Two companions gave 78 and 72 respectively.

THE RED BLOOD CELLS IN PUNA.

The red blood corpuscles appear to proliferate very rapidly on arrival at the altitudes. The usual number of red cells at 15,400 ft., for Indians as well as white people, is between 8,000,000 and 9,000,000 per c.mm. The number varies. It is rarely under 7,000,000, and rarely above 9,600,000. My own count gave nearly always between eight and nine millions. Once, just before I left, it dropped to 7,120,000. The following counts of my own blood are of interest, taken after returning from a month's sojourn at the coast. On the second day I did not take a count, feeling too ill with puna to have much interest in it.

On day of return	6,560,000	Puna
Third day	7,200,000	Puna
Fourth day	7,840,000	
Fifth day	8,240,000	
Sixth day	7,440,000	
Eighth day	7,840,000	
Ninth day	8,400,000	

Afterwards, counted at intervals, it was always between eight and nine millions, except in the instance above quoted.

Mr. B., on day of arrival, February 19, 1911, had a count of 7,120,000. He had two days' puna; on February 24 his count had sunk to 6,360,000. Mr. B. also gave on his first day of another arrival—May 24—a count of 7,760,000. On that occasion also he had an attack of puna.

Mr. V.—the bad heart case (see cardiac puna)—gave on day after arrival 7,840,000.

Mr. D. gave on day of return from a month at sea-level 8,560,000, which was fairly close to his normal for the altitude of 8,800,000. He had no puna.

Mr. E., typical attack of puna, gave 6,880,000 on day of arrival.

Mr. A., whose blood count was always exceptionally low, had a bad attack of puna, and gave a count of 5,400,000 on first arrival. His count, however, never went above 6,560,000.

The table on p. 319 gives in a concise form the condition of thirty-eight cases of puna on first examination.

Though rather outside the scope of this paper, which aims chiefly at describing the conditions found on first *arrival* at 15,400 ft., the tabulation of some blood counts, made on myself and others, Indians and whites, may be of interest, together with, in certain cases, the hæmoglobin percentage.

SELF.

September 5, 1909	8,000,000	
,, 12, 1909	9,600,000	
,, 19, 1909	8,800,000	
,, 25, 1909	9,600,000	
October 12, 1909	8,000,000	
November 12, 1909	9,600,000	
May 6, 1910	8,000,000	
February 10, 1911	8,400,000	(Hb., 90 per cent., February 23)

My present count (January 15, 1912), five months after leaving the altitudes, gives 5,680,000.

OTHERS.

No.	Duration of residence	Nationality	Red blood corpuscles
1	4 months	Englishman	8,800,000
2	3 months	Indian	8,800,000
3	2 years 5 months	American	8,800,000
4	Some months	Indian	7,320,000
5	Some months	Indian	8,320,000
6	Some years	Indian	8,720,000
7	Some months	Indian	8,900,000 (Hb. 100 %)
8	2 years	Indian	7,360,000 (Hb. 95 %)
9	4 months	German	6,640,000 (Hb. 90 %)
10	6 months	American	5,840,000 (Hb. 90 %)
11	2 years	American	8,800,000 (Hb. 90 %)
12	Some months	Indian	8,640,000 (Hb. 85 %)
13	Some years	Indian	9,680,000 (Hb. 95 %)
14	2 years	Indian	9,040,000 (Hb. 100 %)

THE DISTRIBUTION OF *GLOSSINA LONGIPENNIS* (CORTI, 1895).

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AND

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Introductory.—We bring forward this brief note on the distribution of *Glossina longipennis* (Corti, 1895), in accordance with the promises of one of us to Major Powell, R.A.M.C., and to Captain Kelly, R.E., who found the flies in question while exploring, in different directions, the country between the Nile and Lake Rudolf.

The discovery of *G. longipennis* in the Anglo-Egyptian Sudan is interesting, firstly, because it extends the known distribution of the fly to almost 33° longitude east of Greenwich, and, secondly, because it strongly supports Balfour's view, enunciated in 1906, that some day this fly would be found on the upper reaches of the Sobat. Balfour's opinion originated after making inquiries about tsetse flies from the members of Macmillan's expedition, which resulted in his suspecting the region south of Nasser (about 8° north latitude) as being that in which *G. longipennis* might probably exist. Further, the fact that this tsetse is mostly a night feeder, and is frequently met with in desert places, has resulted in rather a lack of knowledge as to its distribution. To-day all species of Wiedemann's genus Glossina must be regarded with suspicion, as the number associated with the spread of sleeping sickness in man appears to be slowly increasing. Thus Macfie has indicated that there may be a new form of the disease in West Africa, and has hinted that this may be associated with some species other than *G. palpalis* and *G. morsitans*. It is therefore valuable to know the distri-

bution of the various species as accurately as possible.

Historical and Geographical.—Glossina longipennis was first discovered in June, 1893, by:—

(1) Captain Vittorio Bottego on the banks of the River Welmal in Abyssinia. (This river is a tributary of the well-known River Juba.) The specimen he found was a male.

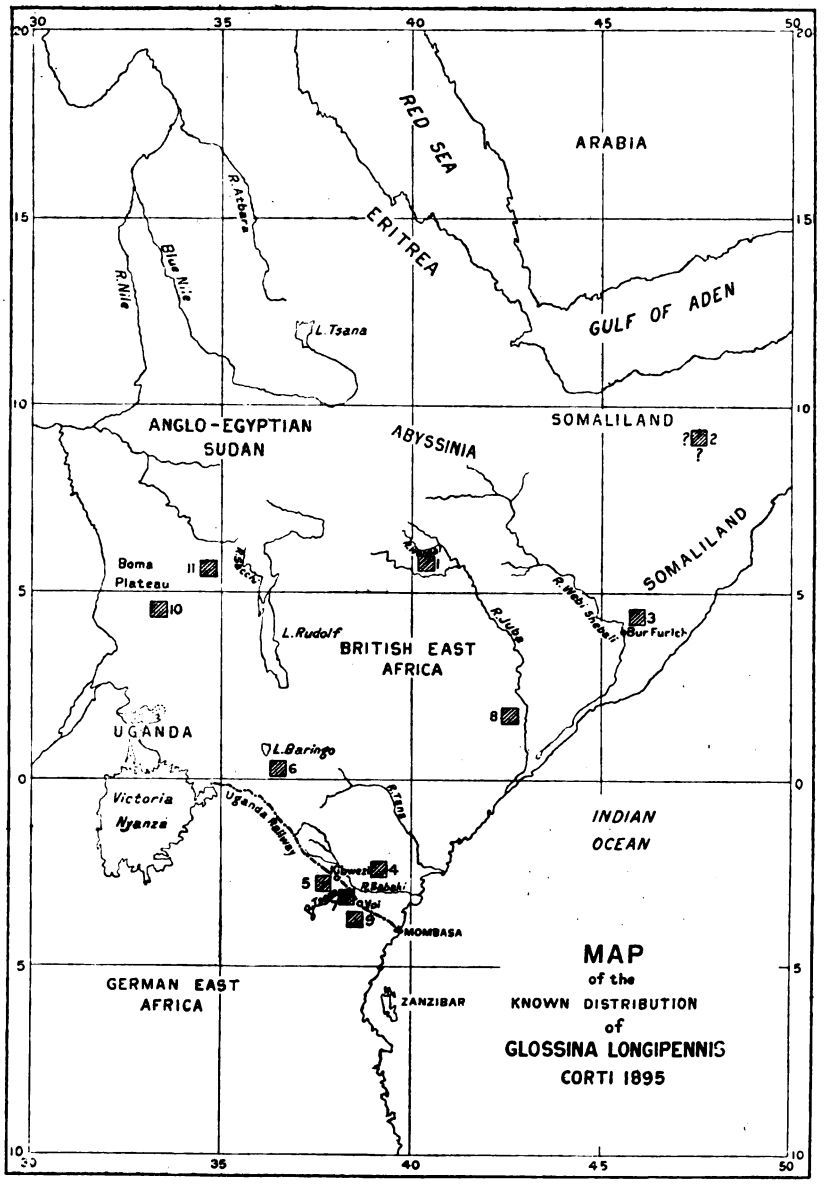
(2) In 1894 Greenfield found two males and one female in Somaliland, but did not indicate the locality, which makes the exact determination of the distribution very difficult.

(3) In 1895 C. V. A. Peel found a female in Western Somaliland in the country between Bur Furleh and Biermuddo, north of Mount Kuldush and east of the Daghato River, which is a tributary of the Webi Shebeli.

(4) In 1898 Captain Haslam met with one male on the Sabaki River in British East Africa. The exact locality was near the junction of the Tsavo and Sabaki.

(5) In 1903 Captain Greig captured one male and one female near Kibwezi on the Uganda Railway.

(6) In 1910 Captain Ford discovered one male on the shores of Lake Baringo, and (7) Woosnam one female on the Tsavo River in British East Africa,



and in the same year (8) Drake-Brockman drew attention to its existence on the Juba River.

(9) In 1912 Neave found numbers in the dry, semi-desert, thorn-scrub of the section of the Uganda Railway between Voi and Makindu.

Occurrence in the Anglo-Egyptian Sudan.—This year specimens of male *G. longipennis* have been given to us by Major Powell, R.A.M.C., and by

Captain Kelly, R.E., who found them in the country between the Nile and Lake Rudolf.

(10) Major Powell found his specimen in the country east of the River Kideppo, *i.e.*, about 5·5° north latitude and about 33·3° east of Greenwich.

(11) Captain Kelly found his specimen just south of 6° north latitude and about 34·6° east of Greenwich, in the country three miles south of Moro Kinod.

This is the first occasion on which *G. longipennis* has been recorded in the Anglo-Egyptian Sudan.

Distribution.—From the above it will be observed that the known area of distribution of *G. longipennis* extends, excluding Greenfield's vague localization, from about 6° north to about 4° south latitude, and from about 33° to about 47° longitude east of Greenwich (*vide* map). This area includes the following political divisions: British East Africa, the south and west of Italian Somaliland, the southern part of Abyssinia, and the south-eastern portion of the Anglo-Egyptian Sudan. The localities in which the fly is found are either desert or semi-desert. When seen in elevated regions it occurs between the rivers, and not on their banks. The fact that it is usually a night feeder may explain the reason why it is seldom reported by travellers, and perhaps why males have been more commonly met with than females. We have indicated on the map the places where *G. longipennis* is found by means of small (shaded) squares. The numbers attached to the squares correspond with those used above in the historical and geographical section.

Khartoum,
September 6, 1913.

LITERATURE.

(*In chronological sequence.*)

(1) Austen, E. E. (1903): "A Monograph of the Tsetse Flies," London. Page 103 contains all the early literature.
(2) Drake-Brockman (1910): *Bulletin of Entomological Research*, vol. i, p. 57.
(3) Austen, E. E. (1911): "A Handbook of the Tsetse Flies," London, p. 104.
(4) Simpson, J. J. (1912): *Bulletin of Entomological Research*, vol. ii, 4, p. 297. Colour Conventions for Insects and Diseases.
(5) Neave, S. A. (1912): *Bulletin of Entomological Research*, vol. iii, 3, p. 308.

COLONIAL NURSING ASSOCIATION.

During the year ending March 31, 1913, the Association have sent out 76 nurses for work abroad, 33 as private nurses, and 43 in Government employ, being the largest number since the commencement of the work of the Association in 1906. During the year they had 298 nurses at work compared to 276 in the previous year.

Requests for nurses have been received from Western Australia, and 10 nurses were sent out in August, 1912. This most deserving Association deserves the keenest support of all travellers and residents in the Tropics.

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THE JOURNAL OF

Tropical Medicine and Hygiene

OCTOBER 15, 1913.

SIR PATRICK MANSON NATIONAL PRESENTATION.

It is proposed to present to Sir Patrick Manson, G.C.M.G., the portrait painted by Mr. Colin Hunter, on the occasion of the dinner of the London School of Tropical Medicine at Prince's Restaurant, on Friday, October 24, 1913.

SPECIAL DRUGS FOR EACH DISEASE.

The "Dock and Nettle" Idea of Therapeutics.

Nothing was perhaps more prominently brought forward at the recent meeting of the British Medical Association in Brighton in July, 1913, and the International Medical Congress in London in August, 1913, than the announcement, as far at least as tropical medicine is concerned, of the inability or the failure of special drugs to alleviate disease or cure persons suffering from tropical ailments. Most of the authorities who read papers or spoke on drugs did so usually, not to announce a cure, but a failure of particular drugs in particular diseases. It may be, as regards tropical diseases, that there has not yet been time to evolve cures, seeing that our scientific knowledge of these maladies is so recent. Not that scientific investigation has ever done much in establishing particular drugs as cures; for our important remedies, mercury, arsenic, cinchona, ipecacuanha, &c., were evolved empirically and before science played any decisive part. What has been done of recent years in connection with these and other drugs is that the chemist has given us appropriate preparations of salts or extracts of these well-known drugs, which have no doubt advanced our knowledge of therapeutics and enlightened us in the ways and means of treatment. Still it must be confessed that, even

at their best, drugs are all too often disappointing, and the explanation may or may not be either faulty diagnosis or misapplied and inefficacious remedies. In time the former drawback will no doubt be removed; methods of precision in diagnosis tend, and in some instances have attained, to what would seem finality, and then it will lie with the therapeutist to advise what drug to use or what course of treatment to pursue. It may be that cure is impossible; this is a contemplation, however, that does not and should not be allowed to prevail. More and more do we believe and know that disease is caused by an invasion of the body of deleterious agencies from without, and the growth and development of this knowledge would seem to justify the idea that all diseases may either be prevented, or that the destructive agencies which generate them having entered the body can be expelled or destroyed. Prevention of disease is the ideal to be aimed at, and it cannot but be said that in Britain at least it has not proved unreliable or impracticable. From these islands we have seen several ailments disappear, or they are kept in check to such a degree that their effect upon the mortality is infinitesimal; amongst these may be mentioned malaria, smallpox, typhus, typhoid, leprosy, and the outbreaks of plague and cholera which used at intervals to devastate the country. The diseases we have with us preventive medicine has not yet overtaken, and we have to rely upon nature's effort or drugs to overcome their consequences. It cannot be said that drugs have done much as direct agents of cure; that they help to assist the body to fight against the evil consequences of the invasion to which the body has been subjected is undoubted, and in that view they are of the first importance and of intrinsic value. The question is: Are we advancing along the proper lines as regards our uses of drugs? The spirit that prevails to-day may be summed up as that of one drug for each disease, a special remedy for a particular ailment. This is an old belief, in consonance with the idea that nature implanted the dock alongside the nettle, so that when stung by the nettle the dock juice may be applied to assuage the pain. The "dock and nettle" principle would seem to prevail in men's minds to-day. Polypharmacy is at a discount; the single drug remedy holds ascendancy; quinine for malaria, mercury for syphilis, &c., set the example, and the modern tendency is to find a single drug to deal with trypanosomes, spirochætes, &c.

It was not so until quite recently. The generation of medical practitioners before us were polypharmacists, and their prescriptions are viewed with something akin to contempt, and ofttimes afford considerable amusement to the younger men of to-day. We are, moreover, not only using single drugs, but we are exacting from out of these single drugs their very essence, such as emetine from ipecacuanha, morphia from opium, &c., and believe that a great advance has been made. This may be so, but no doubt we are apt to be prejudiced by our present-day discoveries in the course we are pursuing. That these subjects should be worked out is most important; it is well to have enthusiasts for "salvarsan," for "emetine," for "quinine" in its several forms, and for the many new remedies showered upon us. It will be remembered, however, by practitioners even in their thirties, that they have seen several loudly proclaimed remedies fall into abeyance. The "soured milk" treatment is no longer the rage; the treatment of tuberculosis by tuberculins of sort and several other remedies and methods of treatment have had their day, and it is possible that the "single drug" remedies of to-day may be replaced by the poly-pharmaceutical methods of yesterday. Is quinine alone the most efficacious method of administering quinine in malaria? Our immediate predecessors in medicine used along with it in their "fever powders" opium, arsenic, and mercury; in their prescriptions for syphilis, opium and other drugs were included, and if we trace medicines back to ancient times we know that many concoctions contain a list of drugs "as long as my arm." That many, in fact most, of these remedies were inefficacious may be true, but that they were not included in the medicine for "appearance sake" only may be believed when it is remembered that the fees charged were small, that they included the price of the drugs in the medicine, and that the fewer the drugs exhibited so the greater would be the monetary profit on the mixture.

Warburg's tincture, a 4,000 years old remedy, even at the time that Dr. Warburg, of Vienna, added quinine to a mixture as old as the time of Mithridates, and thereby gave us a 23rd substance to this ancient and well-known remedy for fever. But Warburg's tincture, in spite of its empirical nature, still holds its position as a "fever remedy," a curious fact at a time when we are extracting the active principles of drugs from their other surroundings and using them. But morphia is not opium, nor is emetine ipecacuanha, and it would be well to preserve an even mind in regard to the "dock and nettle" principle which is dominating our ideas to-day.

J. C.

"Bulletin of Entomological Research," vol. iv, part 2, September, 1913.

Verruga.—Townsend contributes an interesting paper on "Progress in the Study of Verruga Transmission by Blood-suckers." So far, he says, it has not been possible to secure sufficient numbers of *Phlebotomus* for experimentation, the season for them being apparently on the wane, but such work will be started at the earliest possible moment. It is most confidently expected that this work will give prompt and positive results in verruga infection. Theoretically and practically, from all points of view, according to the author, the connection between this *Phlebotomus* and verruga could not be more perfect than it is, save for the actual demonstration of the transmission. It is practically certain that the *Ceratopogon* and other Chironomids cannot carry the infection. While there is yet time for the acarid transmission experiments to show results, and they will be carried straight through, it now appears certain that *Phlebotomus* is indicated above all others as the agency concerned in the transmission of verruga.

Abstract.

A NEW CONCEPTION REGARDING MALARIA.*

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The suggestions that have been made from time to time that our knowledge of malaria is now so complete that it can be reduced to mathematical formulæ and its problems solved by algebraic equations, point to the danger of research becoming stereotyped. Already, if we may judge by many recent text-books and reports, the current idea regarding the investigation of malaria appears to be that it consists essentially in a routine of blood examination, spleen counting, the capture, indentification and dissection of anopheles, and the mapping out of the breeding places of these mosquitoes. But although the brilliant discoveries of Laveran and Ross have extended our knowledge of the parasitology of malaria so far that there appears to be little room for advance in that direction, we are still ignorant of many of the factors responsible for the occurrence of the disease, more especially when it appears in epidemic form among populations like those to be met with in India; and there are reasons for believing that until our conception of infectious diseases in general and malaria in particular undergoes a radical change, these gaps in our knowledge may not only remain unfilled but actually pass unrecognized.

Before proceeding to outline a new and possibly somewhat startling conception regarding disease, based upon the facts that have been ascertained regarding parasitology in general, and largely those especially relating to malaria, Bentley believes that it is necessary to point to certain current fallacies regarding the latter condition which appear to have long escaped recognition, perhaps because of their very magnitude. In the first place attention must be called to the fact that ever since Laveran's discovery of the malaria parasite, medical men have failed to distinguish between *malarial infection* and *malarial disease*. This want of discrimination has given rise to much confusion in the past, and in recent years has led to some heated disputes between those who asserted that there must always be a direct relation between the amount of malaria among a population and the number of anopheles capable of carrying infection, and those who pointed to observations in which it was impossible to trace such a direct connection. There is a wide divergence to be observed between the phenomena of infection and disease, and as regards malaria not only do we possess no evidence to show that morbidity and mortality bear a fixed relation to the occurrence of infection, but many observations in all parts of the world support the view that, under some conditions at least, the amount of malarial disease present in a community may vary inversely with the amount of infection present. Years ago Koch, Stephens and Christophers, and others showed that among children of races indigenous to Africa and New Guinea, the occurrence of almost universal infection with malaria parasites was associated with little or no evidence of disease; and more recently workers in India have pointed out that the infection index of a population may remain almost stationary, although at one time disease might be prevalent and at another time almost absent. Unfortunately, the significance of these observations has been largely overlooked and the word "malaria" is almost invariably applied to describe both the condition of infection and the state of disease which may be associated with it; moreover "*malarial infection*" and "*malarial disease*" are constantly used as though they were synonymous terms. But the distinction is of more than academical importance. A hundred malaria infections in Negro children in West Africa represent a very different condition as regards sickness to that of a hundred infections in Europeans resident on that coast; and the morbidity associated with a 25 per cent. infection-rate among troops in barracks may be very different to that observable amongst them when engaged on arduous field service.

Again in the case of two communities, A and B, possessing respective infection rates of 10 per cent. and 100 per cent., it is highly probable that A may show a larger proportion of cases of malarial disease than B. Or if we represent the monthly infection rate of a community by a hypothetical curve and the morbidity rate by another, there is no certainty that the two will show any marked relation, except when we are dealing with non-immunes, in which case the curves of infection and disease will tend to be the same. A consideration of these facts shows that although it may be possible to demonstrate a definite relation between the "static malaria" of a community and the number of anopheles capable of carrying malaria, it is not at present possible to show a similar relation between the number of anopheles and the amount of disease; and points to the necessity of clearly distinguishing between "*infection*" and "*disease*" whenever the investigation of malaria is undertaken.

The common practice of using as the basis for conclusions regarding malaria, data obtained almost entirely from the study of the condition in non-immunes is also likely to give rise to erroneous ideas, especially regarding the problems to be faced in connection with the disease among partially tolerant races. At present the bulk of the facts recorded about malaria in current text-books and medical journals, relate to observations of infection (usually in cases of disease) among white immigrants to the Tropics or those who have returned to Europe after residence in a malarious country, but until it has been shown that the reactions between the parasite and its host in the case of non-immunes, are similar, at least in kind if not in

* Proceedings of the Third Meeting of the General Malaria Committee, held at Madras, November 18, 19, and 20, 1912. Simla: Government Central Branch Press, 1913.

degree, to those occurring in the case of partially tolerant races, living usually under very dissimilar conditions, the conclusions referred to cannot be accepted as final. There is yet a further point upon which current opinion regarding malaria does not appear to be in accord with fact. It is commonly assumed that the occurrence of malarial infection is an abnormal condition. But although malaria in a Londoner may be abnormal, the presence of the parasite in the blood of children in the West Coast of Africa is as normal a condition as flea infestation is to a dog.

In order that the significance of this fact may be properly grasped it is necessary to take a brief glance at parasitism in general. It is now recognized that parasitism and parasitic infestations are natural conditions both of the animal and vegetable world. Every species of animal harbours not one but many species of parasites; and man, in common with other animals, supports an extensive parasitic fauna and flora. Parasites are as amenable to the ordinary laws of existence as other organisms. They are only found where conditions are suitable for them, and they increase or decrease just as other animals or plants do, in proportion as their environment is favourable or unfavourable to them. As regards the parasites of malaria, observations in all parts of the world have shown that they are to be found in the blood of man wherever conditions are favourable to their continued existence and spread, just as drepanidia occur in the blood of frogs, trypanosomes in the blood of rats and halteridia in the blood of birds. From these observations it would appear reasonable to assume that infestation by the parasites of malaria is a natural condition of the life which a large proportion of the populations indigenous to malarious countries is accustomed to lead under circumstances which favour the continued existence of the organism; and that it is only to be looked upon as abnormal when it occurs apart from these conditions.

It is now possible to outline a hypothesis concerning infective disease in general and malaria in particular which may prove suggestive in stimulating future research both as regards the origin of disease and the methods to be adopted for its prevention or control.

Attention has already been drawn to the fact that parasitism and parasitic infestation are universal rules of the animal world; and that among mankind, the more primitive the habit and mode of life of a race, the more certain it is to be infested with a multitude of parasites of all kinds. But like other animals, man becomes adjusted to his natural parasites and under ordinary circumstances suffers little or no inconvenience from their presence.

If we study mankind in relation to the world of parasites we may note that at one end of the scale is primitive man, tolerating a large assortment of parasites with impunity, and at the other end of the scale is the most highly civilized man, already comparatively free of parasites, and so highly intolerant of them that he suffers serious disease when brought into immediate relation with them.

Just above the savage in the scale are the races which having achieved a few steps towards civilization are content to pass from century to century in a condition of stagnation. They, too, like the savage, support an extensive parasitic fauna and flora, and like him enjoy a comparative immunity under ordinary conditions from unpleasant symptoms, owing to their more or less complete tolerance of their parasites. Until comparatively recent times the bulk of the population of India may be said to have been in this condition.

It has already been pointed out that highly civilized man has largely freed himself from parasites; and it would appear that civilization is largely incompatible with a condition of continued parasitic infestation. This comparative freedom from parasites enjoyed by civilized man has been brought about by the same process of evolution which has stimulated his advance in other directions. The gradual intensification of the struggle for existence between the individual members of a race or species produces a rapid development and at the same time results in the elimination of the most inefficient. The presence of parasites is a handicap, and a cause of inefficiency; they consume energy which might otherwise be usefully expended in work and they lessen the powers of adaptation of the host to his environment; and other things being equal a parasite-free individual or race will always triumph over a parasite-ridden one. Regarded purely as a machine turning fuel into energy the civilized man compares favourably with his primitive brother; and the result is that the work he can accomplish is incomparably greater. This is in part due to the fact that as he has advanced along the path of civilization he has discarded his parasites along with other useless burdens.

It must not be forgotten, however, that side by side with this process of elimination of parasite carriers and parasites owing to the greater stress imposed upon mankind by civilized life, another influence has been at work, assisting to bring about a condition of freedom from parasites. The epidemics of disease brought about among parasite-laden races by the shocks of advancing civilization have had the effect of stimulating mankind to direct attacks upon disease with a view to its control. And it is natural that this should be the case. So long as man's parasites cause him little or no inconvenience, he tolerates their presence; but when they disturb his comfort or threaten his existence he is often aroused to attempt to rid himself of them.

There is little reason, however, to suppose that the conscious struggle of man against disease, which has only become effective in quite recent years, has played a very important part in freeing countries like Great Britain from parasitic infestations such as plague, leprosy, typhus fever, relapsing fever, and malaria, which were at one time prevalent there. And except in the case of malaria and small-pox it is difficult even to guess at the special causes for the disappearance of these conditions.

But although there is no direct evidence to show that malaria disappeared as the result of measures specially directed against it, it is possible to point to certain factors which have exerted a marked influence in bringing about its disappearance. And foremost among these influences has been improvements in agriculture.

Among the more primitive races of mankind who seek their living from the soil, the simplest forms of agriculture are practised. Each family tills a small plot of land no larger than will suffice for its few needs, in a manner requiring as little effort as possible. Land which is most easily cultivated is selected, the simplest implements are used, no manuring, no drainage, and only the easiest forms of irrigation are adopted; and as soon as the soil in one place is exhausted another site is chosen. So long as the pressure of population is not very great these simple methods suffice to supply the wants of the people in ordinary seasons, and there is no incentive to improvement in the system of agriculture. But with advancing civilization man's wants expand, and to supply them he tills a larger area than that required merely to provide him with food and clothing; and by a system of barter exchanges his surplus crops for other products. Gradually as communication with outside markets improves, the demand for all kinds of raw material increases and under the further stimulus of a system of monetary exchange, which soon replaces the primitive methods of barter, agriculture tends to undergo a rapid process of evolution. As manufacture develops, the demand for all sorts of raw material expands, and land at one time used for food crops is turned to other purposes. Partly as a result of this, and partly owing to the fact that large numbers of people who once produced their own supply of food are now engaged in other industries, the price of food-stuffs rises, and in sympathy with this rise, the value of all agricultural produce increases. This brings about increased demand for land, which in turn produces a rise in land values and a corresponding increase in rents. As land increases in value owing to the greater demand, areas which in earlier days were left uncultivated are gradually brought under the plough, waste land and jungle are cleared, swamps and low-lying land are drained. The cultivator also, taught by experience that continued cropping of the soil produces exhaustion, learns to make use of manure, to adopt rotation of crops, selection of seed and advanced systems of irrigation and agricultural drainage. In other words, he no longer looks upon the land as a mine to be worked till exhausted and then abandoned, but as a machine for turning labour into wealth.

By the time he has reached this advanced state of development he can obtain from the poorest land as much or more return than was originally yielded by the best, and the face of the country has undergone a complete change from a waste of forest, undergrowth, and swamp, broken here and there by small patches of cultivation, to a wide expanse of cultivated fields, open pasture, and regulated plantations of useful timber and orchard trees. But it is not only the surface of the land which undergoes a change. As soon as the value of agricultural products rises above a certain level, capital is attracted to the land, and the large farmer enters into competition with the petty cultivator. And with the rise in rents, the necessity for using manure, machinery and other adjuncts of intensive cultivation the competition becomes so severe that the smallholder is gradually ousted, because he possesses neither the capital, the knowledge, nor the ability to exact a full return from the soil. With the elimination of the small cultivator and the introduction of efficient machinery the number of people permanently engaged in actual cultivation of the soil is greatly reduced, the rural population diminishes and that of the towns increases.

Such changes as have been thus briefly described signify a tremendous modification in the environment of a race. And whenever they occur man's relation to malaria undergoes a complete alteration; for the conditions under which he lives are no longer favourable to the existence and spread of the parasite. It has often been stated that malaria has been eradicated from a country by drainage alone or by drainage combined with the clearing of jungle. but it appears more likely that a development, more or less rapid, of the whole system of agriculture in a locality, involving not only drainage and clearing of jungle, but a number of other changes in the environment of the population concerned, has been responsible for the reduction or disappearance of malaria from the country.

Many years ago, while England was still producing its own food supply, the high prices obtained for wheat stimulated the exportation of this grain to Continental ports. This export trade was still further encouraged by the offer of a Government bounty on every shipment. It is possible that this circumstance was partially responsible for the reclaiming and cultivation of vast areas in the fen districts. These districts at one time notorious on account of malaria subsequently became famous for their wheat production and still produce a large amount of grain. Huge areas of low-lying land in that part of England, much of it situated below sea-level, have been reclaimed by a system similar to that adopted in Holland. The rivers flowing through that part, which at one time overflowed the country after every heavy fall of rain, have been retained within embankments; sluices are used to regulate flood and tidal water; and to drain the land a network of low level drains or dykes, together with high level drains upon embankments, is employed. Windmills were originally used to work the pumps required for raising the water from the low to the high level drains, but these have now been replaced by steam plant, and the same plant which in wet weather removes the excess of water from the fields is used in time of drought for irrigating the land from the rivers and high level water channels.

But although the system of reclaiming and draining a country in this way has had an immense influence in bringing about a reduction in malaria,

it would be a mistake to infer that the same results would follow the adoption of schemes of drainage aimed at the mere reduction of malaria, rather than the development of agriculture. Attention must also be called to another important point in this connection. The freeing of the fen districts of England and the greater part of Holland from malaria has been achieved not by the expenditure of vast sums on sanitation by the State, but by the enterprise of private persons. And the farmers and landholders who have been instrumental in effecting this improvement have been stimulated to carry out this work not with a view to improve the health of the country, but because they wished to increase or secure their own profit.

Turning to India it may be observed that the vast mass of the population is still in a very primitive condition. The coolie, the cultivator, the petty trader and craftsmen still live a simple life, with few and easily satisfied wants. They are still mostly without education; and the only ambition they possess is the wish to live as their forefathers have done for centuries. In common with other primitive peoples the masses of the population support an extraordinary variety of parasites; and under ordinary conditions and so long as they have sufficient food, water, clothing, and shelter, in other words, so long as their environment remains unchanged, and their adjustment to it in balance, disease occurs only as a very minor phenomenon amongst them. But within the past fifty years a series of extraordinary changes have been going on all over the country, and the environment of many millions of the people has undergone enormous modification. The construction of many thousand miles of railway, the covering of the country with a network of roads, and the organization of fast steamer services around the coast and on the inland waterways have simplified means of communication, and given rise to an active export and import trade. Millions of cultivators in Bombay, Bengal, and the Punjab whose fathers were engaged merely in the production of the few necessaries required for their own families, are now busy supplying not only the markets of Bombay and Calcutta, but those of the world, with cotton, jute, and wheat. Side by side with these larger changes a host of smaller ones has been brought about, affecting every district. Old village industries have dwindled; the small weaver, the oil maker, the lime burner, and a host of other petty crafts are fast disappearing; trade is now everywhere conducted through the medium of currency instead of barter; wages are everywhere paid in coin instead of in kind. There is not a single advance towards civilization that has not brought about a huge modification of the environment of the people. The development of the tea industry in Assam, the coal mines of Bengal, the jute mills of Calcutta, and the cotton mills of Bombay has entirely altered the life of millions. Even the introduction of a postal and telegraph system, the laying of cables to Europe, and the construction of the Suez Canal, have exerted a profound influence upon the people, for the cultivator in Bombay, Bengal, and the Punjab has thus been brought into direct relation with the markets of the world, and fluctuations in the price of cotton, jute, or wheat on the exchanges of Europe may bring him either prosperity or adversity.

Partly as a direct result of all these changes, and partly from other causes, but mainly because India is now linked up with the world, there has been a steady and continuous rise in the cost of living; and the increased price of food, together with a gradual improvement in the standard of comfort, is rapidly effecting a great intensification in the struggle for existence among all classes of the community.

Thus in the brief space of fifty years a change so vast as to be almost inconceivable has been effected in the environment of a primitive, parasite-laden race. And as a direct result of the successive shocks by which this change has been brought about, the balance of life of myriads has been again and again upset, the delicate adjustment by which their parasitic infestations were kept in control been broken down, and appalling epidemics of disease been brought about amongst them at frequent intervals. And the poorest, the most ignorant, the most parasite-laden and least adjustable classes of the community suffer most severely at the time of these epidemics, demonstrating by this fact their inability to meet the strain of life under the changing conditions of advancing civilization.

Briefly summarized the conception which has been outlined in the foregoing pages may be stated thus:—

Parasitism and parasitic infestation are universal conditions of life; and man in common with all other animals is the natural host of many species of parasites. But civilized man when contrasted with primitive man is comparatively free of parasitic infestations, the conditions of his life being less favourable to the existence of parasite organisms. Under natural conditions all organisms become adjusted to their environment, including their parasitic associates, and disease as generally understood either does not occur amongst them at all, or only appears as a very minor phenomenon.

Sudden changes of environment, however, such as that occasioned by unusual seasons, may upset the balance of life, and give rise to serious manifestations of disease, in the course of which the less resistant members of a race or species perish.

In common with many other parasites the malarial organism is to be found associated with man wherever the conditions of his life lend themselves to its existence; and as primitive races generally live under conditions favourable to malaria they are frequently found to be infested with the organism.

Primitive man like other animals is normally in a state of adjustment to his environment, which includes numerous parasitic infestations, to which under ordinary circumstances he is tolerant. But any change in his environment at once modifies his relationship to these parasites; and in proportion as it is sudden and severe may lead to a manifestation of disease.

Primitive man is usually only exposed to such temporary changes in his environment as those

occasioned by exceptional seasons. But the advance of a race towards civilization is marked by recurring changes in its environment, often extraordinarily serious in their character.

In the process of civilization individual members of a race, who fail to adjust themselves to the changing conditions of life, succumb to the strain, and fall victims to the attacks of the parasite to which they have previously been tolerant.

Epidemic disease is a natural accompaniment of the early stages of advancing civilization; and it is a beneficent process; because in no other way can a parasite-laden race so speedily rid itself of its parasite carriers and parasites.

The phenomenon of epidemic disease is thus always the result of a change in environment. When it occurs among primitive races it is usually due to (*a*) exceptional seasons, or (*b*) changes of advancing civilization. Under both these conditions, previously tolerated parasites give rise to disease. But the change of environment producing disease among a population may itself be the presence of an unfamiliar parasite. The changes of environment producing epidemic disease among highly civilized races appear to be usually of this character.

Viewed in the light of this conception the problem of disease takes on a new aspect. Epidemics, whether of malaria, plague, cholera, and other infective disease to which such races as those occurring in India, China, and Russia are prone, appear no longer mere isolated, inexplicable catastrophes; but as perfectly natural phenomena, fundamentally related to each other, however profoundly they may differ in their manifestations.

The investigation of disease becomes essentially a study of man's relationship to his environment, of which parasites form only a part. It follows that the investigation of the causes of malarial disease among a population necessitates a consideration not only of the parasites of malaria and anopheline carriers which may represent only one factor in the condition, but an inquiry into every detail of human environment with a view to determining that special circumstance which has occasioned the outbreak.

In a country like India, therefore, the more highly specialized forms of sanitation, such as have been devised in recent years against yellow fever and malaria, must be applied with discrimination. They should be adopted in large cities with enlightened populations, among troops and jail communities, and in connection with such industries as tea planting, mining, &c., for under such conditions they are most likely to offer a return commensurate with the expenditure incurred. They are also called for in rural towns, but more especially for educative reasons. And in such places on no account should this educative function be sacrificed to the often futile attempt to obtain immediately obvious results. No doubt the State, by the deputation of specially skilled officers and the grant of funds, can carry out specific measures against malaria much more efficiently than the municipal commissioners of a small town; but the effect of such work when done by Government is to undermine the independence of the townspeople, impair their sense of responsibility, and stifle effort at self-improvement. And so, though at first municipalities will do the work very badly, they must be stimulated and encouraged to undertake it independently of Government aid.

The attempt to reduce malaria by such measures as drainage or the clearing of jungle, unless accompanied by an extension and improvement in cultivation, is foredoomed to failure. Instead of dissipating large sums of money in the vain hope of reducing the incidence of malaria in a few localities in rural areas, attention should be concentrated upon improving the existing methods of agriculture by every possible means. To this end, not only should special efforts be directed to educate the cultivating classes of the population, develop their intelligence, foster their ambition and independence, and improve their standards of comfort, but attempts should be made to induce capitalists to undertake large-scale agricultural operations wherever possible.

The chief function of the State in regard to problems of sanitation should be mainly that of educating the population. And although it may initiate reforms, the actual carrying out of the measures should be left as far as possible in the hands of the people concerned, for without their intelligent co-operation no scheme of improved sanitation can be made effective.

In conclusion it may be pointed out that just as we can trace the origin of many epidemics of disease among a primitive people to the changes wrought upon their environment by advancing civilization, so it is to civilization carried to a greater length that we must look for the remedy to these conditions. And although we shall not in our day see the elimination of malaria from India, we may rest assured that it will be accomplished in the future, as certainly and as completely as it has been brought about in England.

Notes and News.

Bovril, Ltd., have been awarded the Grand Prix at the Ghent Exhibition, and also a Diploma for excellence at the Congo Belge Exhibition, Elizabethville. This double distinction, which heads a long list of previous awards, is certainly a high tribute to the excellence of the world-famous beef beverage.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the Journal of Tropical Medicine and Hygiene should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

BRONCHIAL SPIROCHÆTOSIS.

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INTRODUCTORY.

So far as we are aware no one has hitherto noted the presence of bronchial spirochætosis in the Anglo-Egyptian Sudan, where it is apparently not uncommon, and this, together with the fact that the disease has so far been recorded from but few tropical localities, has induced us to bring forward the following observations, with the hope that it may stimulate an inquiry into the causation of bronchitis and of obscure cases of pseudo-phthisis in the Tropics and elsewhere.

HISTORICAL.

Some years ago Eichorst found spirochætes in small numbers in the sputum of cases of bronchitis, and Bertarelli with Volpino, in 1905, noted forms like *Spirochæta buccalis* and *Treponema pallidum* in the sputum of a person suffering from heart disease, but no importance was attached to these researches. In 1905 Castellani saw spirochætes almost unassociated with other organisms in cases of bronchitis, and Rona noted the same organisms in cases of gangrene of the lungs. In 1906 Castellani, who, with his usual care, had followed up his cases, came to the conclusion that there was a specific disease of the lungs caused by these organisms, and this disease he named bronchial spirochætosis. His findings were speedily confirmed in the same year by Branch, in Kingstown, St. Vincent, but neither observations seem to have attracted much attention. In 1907 Mühlens reported the presence of spirochætes in gangrene of the lungs, and considered them to be mouth spirochætes which had wandered into the lungs. In the same year Küster described two cases of lung gangrene in which he found organisms resembling *T. pallidum* (Schaudinn, 1905). He considered it probable that these organisms were the actual causal agent of the gangrene. Also in the same year Castellani named the spirochætes he had found *Spirochæta bronchialis* (Castellani, 1907). Early in 1909 Waters described typical cases of bronchial spriochætosis as seen in Tundla, in India. In September of the same year Castellani gave a fuller description of the disease in a paper read at the annual meeting of the Tropical Section of the British Medical Association. Also, in 1909, Phalen and Kilbourne described a case of pulmonary spirochætosis in a Filipino in the Philippine Islands, but considered that the causal rôle of the organisms was not proven. In 1910 Castellani gave a detailed account of the disease in the first edition of the "Manual of Tropical Medicine," written by himself and one of us, and in the same year Rothwell published four cases of bronchial Vincent's angina in which spirochætes were associated with fusiform bacilli; also in the same year Buvay published histological researches on gangrene of the lung, in which he found spirochætes of the nature of *S. dentium*, together with *Bacillus fusiformis*. About this date Peters, in Cincinnati, reported cases of pneumonia and fœtid bronchitis in which spirochætes, associated with fusiform bacilli, were present in large numbers. In 1911 Chamberlain described two cases of bronchitis, one with hæmoptysis, in the Philippine Islands, and lastly, in 1913, Castellani's latest account appears in the second edition of the "Manual of Tropical Medicine" mentioned above.

From this historical sketch it will be noted that spirochætes of various sizes and descriptions have been seen by several observers in different parts of the world, associated with inflammation of the bronchi alone, or together with that of the lung tissue. It will also be observed that the whole subject is at present open for further research as to the relationship between the spirochætes and the various inflammatory conditions in which they are found.

GEOGRAPHICAL DISTRIBUTION.

Cases have been reported in the temperate zone and in the Tropics. In the former they have been observed in Europe and in the United States. In the latter they have been seen in Ceylon, India, the Philippine Islands and the West Indies, and now for the first time, so far as we know, in Africa in the Anglo-Egyptian Sudan, and we are privately informed that it will be reported shortly from another part of Africa. With regard to the Anglo-Egyptian Sudan, we have met with ten cases in the last two months, but medical officers who have great local experience assure us that it will in all probability be found to be a very common disease here. As may be expected, most of our cases have been found in Khartoum, but one case came from farther south.

FIG. 1.—*Spiroschaudinnia bronchialis* (Castellani, 1907), as seen by dark-ground illumination. The phase represented is probably that which occurs just prior to the liberation of the granules depicted therein. These granules may possibly be the infective agent. Magnification about 2,000 diameters.

RACIAL DISTRIBUTION.

The reported cases are in English, Sinhalese, natives of India (probably very different races), Arabs, negroes (probably very different races) and Filipinos.

ETIOLOGY.

In the cases which we have seen in the Anglo-Egyptian Sudan and in Ceylon we have found large numbers of spirochætes in the sputum, and relatively but few bacteria, and no other organisms such as fungi.

The typical form as seen by dark-ground illumination is depicted in fig. 1, and the various forms

which we have observed in stained specimens are shown in fig. 2.

It is not our intention to describe the morphology or the life-history of this Spiroschaudinnia, as this will be done by Dr. Fantham, the well-known investigator of spirochætes, who is at the present moment at work in this laboratory, but we may say that our observations tend to show that *Spiroschaudinnia bronchialis* (Castellani, 1907) is a good species, and that the different forms may probably be closely related to one another as different phases of growth and division of one and the same spirochæte rather than different species of spirochætes.

The question which concerns us here is whether this spirochæte is or is not the cause of the bronchitis.

Ever since Charles Badham in 1810 introduced the term bronchitis the list of possible and probable causes of the disease has been gradually growing and changing, but in our opinion there is no doubt that it usually depends upon two factors: (*a*) Primary cause; (*b*) secondary cause.

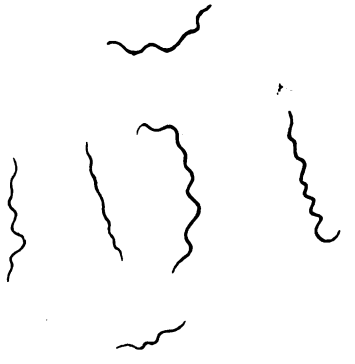

FIG. 2.—*Spiroschaudinnia bronchialis* (Castellani, 1907), as seen in specimens stained by Leishman's method and carbolthionin. The various forms depicted probably represent different stages of growth and division. Magnification about 1,500 diameters.

The essential or primary cause may be physical, chemical, or parasitic. As far as we know, physical and chemical causes as primary agents can be excluded in our cases and experiments, though we shall endeavour to show later that the physical secondary causes are of importance.

We are therefore reduced to parasitic causes, which may be divided into the vegetal parasites and the animal parasites. In the vegetal parasites there are the fungi and the bacteria to be considered. With regard to the fungi, Castellani and others have shown that they may be the cause of broncho-moniliasis, broncho-nocardiasis, broncho-aspergillosis, broncho-penicilliosis, broncho-mucormycosis, broncho-sporotrichosis, &c. These can be definitely excluded in our cases, as we have not found them in the sputum either by direct examination or by cultivation.

With regard to bacteria they are not so easily dismissed, but we have failed to see or to grow many organisms in several of the cases we have examined, and in this we support the early findings of Castellani, who says: "They (the spirochætes) were generally mixed with some bacteria, but sometimes when the sputum was collected in sterile Petri dishes and preparations made at once they were practically the only germs present."

The tubercle bacillus has also been excluded from all the cases by repeated examination of the sputum, and by Castellani by the inoculation, of guinea-pigs, which, at present, are too valuable here to be expended upon an experiment already performed.

As neither bacteria nor fungi appear to be the essential cause, and as spirochætes are in abundance in the expectoration, it is necessary to consider them in detail.

Firstly, are they merely mouth spirochætes which, owing to some secondary condition, have been induced to wander into the bronchi? Our answer to this is in the negative, for the following reasons:—

(1) We have found mouth or throat spirochætes in some of the cases, but these were morphologically different from the typical forms of spirochætes in the bronchial mucus, and could be differentiated.

(2) We do not believe that the disease is caused by an increase in the number of the mouth or throat spirochætes and their invasion of the bronchi because of the following experiment:—

A monkey, which had a small number of fine, easily recognized spirochætes in the top of its larynx, was intratracheally injected with some sputum from the case of mixed broncho-spirochætosis and pneumonia mentioned below. The spirochætes, which were very few in number, were all dead before the injection was made. After injection the monkey was severely chilled by rubbing its chest with ice and exposing it to the blast of a quickly running electric fan. The monkey developed a coryza, and later a broncho-pneumonia, from which it subsequently died. An immediate *post-mortem* was performed, and the pneumococcus was obtained from the bronchial secretion and the patches of the lungs. A very few of the laryngeal spirochætes mentioned above could be found by diligent search in the bronchial mucus, and they were identical with those seen before injection.

This experiment tends to show that merely chilling a monkey or injecting it with the pneumococcus will not lead to marked increase in the number of the usual spirochætes normally living in the top of the throat and in the bronchial secretion.

Secondly, if *S. bronchialis* (Castellani, 1907) is not a mouth spirochæte, what is it? We believe that it is a specific spirochæte, and that it causes bronchial spirochætosis, because:—

(1) The spirochætes are always present in abundance during the attack, diminish during convalescence, and are subsequently either absent or found with difficulty

(2) The spirochætes of all our cases appear to belong to *S. bronchialis* (Castellani, 1907).

(3) The spirochætes found in the Anglo-Egyptian

Sudan appear to be the same as those observed in Ceylon.

(4) A monkey living in good health in our monkey house was examined, and found to contain a small spirochæte in its pharyngeal mucus. This organism was easily differentiated morphologically from *S. bronchialis*.

This monkey was injected intratracheally, and, unfortunately, owing to a sudden movement on the part of the animal, also extratracheally with some expectorated sputum from a well-marked case of bronchial spirochætosis; after this injection it was chilled.

In about thirty-six hours it became very ill. It was unable to eat its food, developed a temperature of 106·3° F. at night, had a peculiar kind of cough, and showed a quantity of mucus hanging down from its muzzle. The mucus from its throat was examined, and was found to be full of spirochætes similar to *S. bronchialis*. In a couple of days the monkey became very much better, the cough disappeared, it ate its food, and no more spirochætes could be found, but it still had some fever. It was then killed, and on *post-mortem* examination was found to have a serous anterior mediastinitis due to the extra-tracheal injection.

This experiment, to our mind, shows that *S. bronchialis* can live in the air-passages of a monkey. That it can produce increased bronchial and tracheal mucus, because, with the disappearance of the spirochætes, the excessive mucus was no longer present, and that it can at all events assist in the production of fever, because the temperature was higher when the spirochætes were present than afterwards.

Animal experiments are being continued, and their results will form the subject of a future paper.

(5) A young English scientist arrived in Khartoum in January of this year, coming direct from England, where he had been passed as medically fit for service in the Sudan. He worked in another part of these laboratories, but frequently came into the rooms where patients suffering from spirochætosis were spitting up or had spat up mucus and where examinations were made. No one is known to suffer from bronchial spirochætosis in the house in which he lives, though, of course, there are several people suffering from the disease in Khartoum. It must, however, be admitted that he came in contact with a large percentage of the known cases while in the laboratory. Moreover, the heat of the Sudan summer had most evidently affected his general health.

A few days previously he caught a chill while sleeping on a covered verandah during a heavy rain storm, and in about twenty-four hours complained that he did not feel well, and reported sick thirty hours after the chill. All his organs were found to be healthy with the exception of his right lung. The blood, which appeared quite normal, contained no parasites. The fluid from his mouth contained no spirochætes, nor did that from the pharynx. Swabs from his tonsils, which were quite normal, showed a Gram-negative diplococcus, which is very common here. We are well acquainted with the cultural characters of this diplococcus, as well as with its pathogenicity, but he showed none of the usual pathogenic signs produced by this organism.

After washing his mouth and gargling his throat he expectorated a small quantity of mucus, in which *S. bronchialis* was quite easily found. The spirochætes were fairly numerous, though not present in the enormous numbers which we have seen. Singularly few other organisms could be found, and no tubercle bacilli could be detected.

On examination it was found that his temperature, which at first was 101·6° F., had risen to 102° F., and that his pulse rate was 90 beats per minute, while his respirations were 20 per minute. (*Vide* fig. 3.) He complained of a sensation of tightness in the chest. Nothing could be detected by palpation or percussion, but on auscultation a few râles could be heard over the right lung in an area of about 4 in. in diameter just superior to the right nipple.

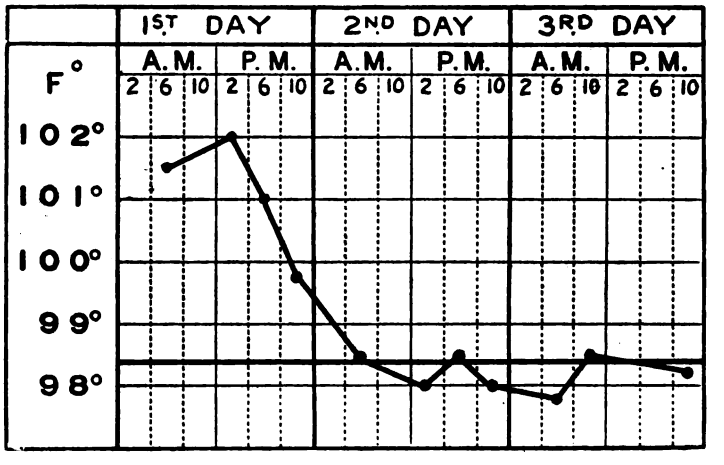

FIG. 3.—Temperature chart of the English Scientist.

He was diagnosed as suffering from bronchial spirochætosis and taken to hospital, where, under careful nursing, his temperature quickly fell to normal, a feature we have observed also in native patients when suffering from acute attacks. He was treated with arsenic. His chest symptoms improved, and the spirochætes promptly disappeared from his sputum, and he was convalescent.

This case appears to us to be as nearly as possible a case of experimental human broncho-spirochætosis. It was promptly diagnosed and promptly treated, and was therefore cut short, but if it had been neglected it might have developed symptoms similar to those seen in worse cases in natives.

As far as we know, this is the first case ever diagnosed immediately after the onset of a first attack.

(6) Just as this paper is about to be forwarded to England one of us has developed a cold in the head associated with the signs and symptoms of mild laryngitis and tracheitis, and with the presence of

Spiroschaudinnia bronchialis in the sputum. This attack appears to us to be due to direct infection during the present investigation, with a chill as a secondary cause. It might almost be classed as belonging to infections of experimental origin.

To summarize: We believe that *Spiroschaudinnia bronchialis* (Castellani, 1907) is the cause of a form of bronchitis occurring in the Anglo-Egyptian Sudan because of:—

(1) The appearance of bronchial spirochætes in one monkey, even though there was such a complication as an anterior mediastinitis of experimental origin.

(2) The almost experimental infections of the young English scientist, and one of ourselves.

(3) The presence of *S. bronchialis* in abundance in the expectoration of cases during the attack, and in the experimental monkey during its bronchial attack.

(4) The apparent exclusion of other causes.

Secondary Causes.

It is possible that chills may act as secondary causes, and we are supported in this view by the history of the scientist mentioned above.

Method of Infection.

In our examination of persons having a history of attacks of probably this disease, but who were at the time well, we have, after diligent search, found in the bronchial expectoration perhaps one or a few spirochætes closely resembling, if not identical with, *S. bronchialis*. Also in our patients when convalescent or recovered we have been able to find with diligent search one or more spirochætes. From these few observations, and from the case of the scientist mentioned above, we would suggest that the human carrier is the infective agent, and that probably the disease will not develop unless the body resistance is lowered by some other cause such as a chill.

Symptomatology.

In general the symptomatology of our cases is that of mild attacks of acute bronchitis, separated by intervals of good health or of a more chronic illness closely resembling the early stages of phthisis, and sometimes associated with slight hæmoptysis. The following case may be recorded:—

A male Arab, aged 22 years, born in Kordofan, where he lived three years, was brought up in Khartoum, where he lived healthily, as did his family, till about four years ago, when he was ill for about twenty-one days with cough and fever. After his recovery from this attack he remained quite well for about two years, when he had another slight attack. After this he was quite well until this year, when he developed a slight cough and a little fever which made him feel ill at night, but in a few days there was a lull in the illness, and he felt better, though still troubled every day with a slight cough. After about three weeks he again became ill with fever, reaching between 101° to 102° F. at night, falling in the morning to 99° F. His cough now became worse, and the expectoration, which at first was scanty, now became more profuse, and he complained of pain over the upper part of the sternum at the level of the fourth dorsal vertebra.

On examination he was found to be very thin (a not unusual feature in a young Arab), but all his organs appeared to be normal. The respirations at the time of examination were not markedly increased in number, allowance being made for the excitement over the examination. On palpation some slight fremitus due to râles could be felt. Percussion revealed no abnormality. His breath sounds were normal, but a large number of fine râles could be heard all over the chest, both anteriorly and posteriorly. The vocal resonance was normal.

His sputum was carefully examined. It contained no tubercle bacilli and very few other bacilli, but a very large number of forms of *Spiroschaudinnia bronchialis* (Castellani, 1907). His blood was carefully examined, but no malarial or other parasites could be found.

A composite blood examination of this and other cases gave the following results:—

	During attack	During interval
Hæmoglobin	80 per cent.	100 per cent.
Red corpuscles	3,648,000 per c.mm.	4,400,000 per c.mm.

A marked leucocytosis was present, and the composite differential count of 2,719 white corpuscles gave the following percentage:—

Polymorphonuclear leucocytes	73·3
Mononuclear leucocytes	6·6
Large lymphocytes	10·6
Small lymphocytes	6·6
Eosinophile leucocytes	2·6
Transitional cells	0·2
Mast cells	0·1
	100·0

He improved rapidly under treatment, and when examined again after an interval of four days was much better, and only a few râles could be heard, while his temperature was 99° F., and only a few spirochætes could be found. After another week no râles could be heard, the temperature had become normal, no spirochætes could be found, and the patient felt quite well. He remained in good health and apparently free from spirochætes till a few days ago, when with the advent of rain he developed a slight cough, and a few spirochætes appeared in his sputum.

The above history appears to us to be typical of the cases seen here. It is probable that the other attacks of illness mentioned therein were also broncho-spirochætosis. There is, however, another symptom not found in the above case which we have met with twice, and this is a pleuritic rub.

The disease as seen here, therefore, consists of a number of acute or subacute attacks separated by longer or shorter intervals of fairly good health.

Complications.

The disease may be complicated by various other parasites; for example, we have met with a case complicated with the pneumococcus, and Branch found one complicated by the tubercle bacillus and malaria, while Buvay and Peters have met with cases complicated by the fusiform bacillus. Other complications may reasonably be expected as the history of the complaint becomes better known.

Complication with the Pneumococcus.

The following is an account of a case complicated by the pneumococcus:—

A native of the Sudan was seized with a chill on June 27, 1913, and complained of pain in the left side of the chest on breathing deeply.

Second Day.—The temperature rose to 101° F. in the morning, and remained about that during the day. No physical signs could be observed.

Third Day.—The morning temperature was 99° F., and the evening temperature 103° F., and there was increased pain on the left side of the chest. The frequency of the respirations was not increased, but the patient coughed up a quantity of blood-stained sputum. A slight friction sound could be detected around and below the left nipple.

Fourth Day.—The symptoms remained unabated, except that the pain was relieved by cupping.

Fifth Day.—The temperature in the morning fell to 98° F., and in the evening rose to 101° F. The symptoms remained as indicated above.

Sixth Day.—The temperature was 103° F. in the morning, and 102° F. in the evening. During the day the patient complained of pain on the neck and occiput. A few sibilant râles were noted over the left lung, especially posteriorly. The sputum continued to be blood-stained, and when examined showed numerous spirochætes, some of which are demonstrated in fig. 2, and some pneumococci. The diagnosis of acute bronchial spirochætosis complicated by broncho-pneumonia was made.

Seventh Day.—The temperature was 102° F. in the morning, and 103° F. in the evening.

Eighth Day.—The temperature was 101° F. in the morning, and 104° F. in the evening. He had severe headache.

Ninth Day.—The temperature fell to 99° F. in the morning, and was 100° F. in the evening, and though the patient vomited he was not worse.

Tenth Day.—The temperature fell to normal, and the symptoms subsided.

Eleventh Day.—The temperature was normal. There were no physical signs, no symptoms, and the spirochætes had practically disappeared from the sputum, but the pneumococci persisted.

Diagnosis.

The diagnosis of broncho-spirochætosis can only be made by a careful examination of the sputum. A small quantity of fresh sputum is placed on a thin, white, clean slide, and covered at once by a very thin, perfectly clean cover glass, which is well pressed down. The cover glass is then surrounded by vaseline to prevent evaporation, and the specimen is immediately examined by means of the dark ground illumination, which is quickly and easily produced by a Zeiss paraboloid condenser, a Nernst lamp, a 2 mm. apochromatic lens, and a 2 or 4 compensating ocular, or some similar combination of lenses. Failing this equipment, a film may be spread on a slide, dried, fixed by heat, and stained by toluidin blue or carbol-thionin, or simply dried or fixed wet with osmic acid, and coloured by Leishman's stain, when the spirochætes are usually so numerous that they can be found; but this method of examining stained films is much inferior to the quicker, surer and simpler method of dark-ground illumination. The rough diagnosis having been made, it is advisable to examine the teeth for caries and to try to find the dental spirochætes; then to examine the buccal secretion (collected by a sterile capillary tube) and the secretion of the tonsils and pharynx for spirochætes. The patient should then wash his mouth and gargle his throat with clean water, and should then cough up his sputum again into a sterile (or flamed) Petri dish. The sputum so collected should be examined by the dark-ground illumination, when it will be noted that the spirochætes, though numerous, tend to collect in special areas of the film, and may therefore require a little search. They are, however, more numerous than dental or mouth spirochætes, and this, together with their characteristic appearance, confirms the diagnosis.

The differential diagnosis has to be made from *acute bronchitis* due to other causes and from *incipient phthisis*, and less frequently from *malaria* and *paragonimiasis*.

From *acute bronchitis* due to the influenza bacillus, pneumococcus, *Diplococcus catarrhalis* and other diplococci, as well as to the fungi mentioned above, it may be differentiated by the absence of these organisms and by the presence of the numerous examples of *S. bronchialis*. If one of the above is present along with *S. bronchialis*, it is obviously a double infection.

From *incipient phthisis* it is differentiated by the absence of the tubercle bacilli in the sputum, the absence of tubercular lesions after inoculation of guinea-pigs, and, if thought necessary, by the ophthalmo- and cuti-reactions. It must, however, be remembered that the tubercle bacilli may complicate a case of spirochætosis.

From *malaria* it is differentiated by the absence of the parasites in the blood, but again it must be remembered that malaria can be present as well as broncho-spirochætosis.

From *paragonimiasis* by the absence of the characteristic ova in the sputum, though again no doubt cases will some day be reported with this disease as a complication.

Prognosis.

This is good, as the disease appears to be readily amenable to treatment in its acute phases.

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Tropical Medicine and Hygiene

NOVEMBER 1, 1913.

WHEN TO COME HOME FROM THE TROPICS.

NOTES ON ANSWERS TO SCHEDULE SENT OUT.

(See page 337.)

THE remarks of the several contributors to the queries in this subject are very helpful. The subject is a difficult one and few care to place their opinions in writing upon so debatable a theme; all the more are we indebted to the contributors for the expression of their opinions.

The best time to reach home is in four of the replies declared to be the early summer, and Major Stodart alone recommends the winter. The writer, when he issued the circular, pointed out the advantages of wintering in Europe for persons who had been suffering from malaria in the Tropics, especially when a visit to Switzerland in the month of January is possible. The writer, and no doubt many others, agree with Major Stodart as to the advantages of winter for tropical residents reaching home for certain ailments, more particularly malaria. Practical experience has shown the writer the great benefits derived from residence at high altitudes in Switzerland during January in malaria, especially when there is enlarged spleen; no other method of treatment can reduce a spleen so rapidly as a sojourn at this time of the year in Switzerland or other countries where similar conditions obtain. Wintering in England has many drawbacks during January, February and March, but during October, November and December the conditions are, as a rule, quite suitable for tropical residents; when January comes round Switzerland is highly beneficial and suitable up to towards the end of February, by which time the usual six months' leave will be up and the traveller has to return to work abroad.

Sojourning in the South of Europe.—The idea that it is necessary to "gradually cool down" before reaching British shores by a sojourn at some place along the Mediterranean littoral finds two supporters, whilst three deny its benefits. The plan of getting accustomed to cooler regions before risking a cold climate is a custom that has the stamp of time upon it, for it was a proceeding at one time looked upon as essential. Now the opposite opinion is commonly held, and the belief that the sooner a malaria-stricken person gets into colder regions the better the chance of a more speedy riddance of infection.

The question of winter sports in Switzerland is answered by four in the affirmative and by one, Dr. Villejean, in the negative. As usual, there are "pros" and "cons" in this as in every other question of the kind Where individual idiosyncrasies have to be considered seldom are two cases alike, but it may be taken as a general rule that in the case of the younger men or women suffering from malaria with enlarged spleen the change to Switzerland in winter is beneficial, and unless anæmia is very pronounced they ought to be encouraged to take part in the ordinary winter sports. Major Graham, very wisely it would seem, thinks that "it is beneficial after a summer, autumn and early winter at home (in Britain)." He is of opinion that a "sudden transfer to a cold temperature induces relapses."

Residence by the Sea, Inland, or at High Level whilst in Europe.—Dr. Villejean considers the seaside preferable; Major Stodart recommends the east coast or dry upland districts; Major Graham agrees with Major Stodart, and mentions Dornoch, in Sutherlandshire, Scotland, as particularly suitable; Dr. Landsborough is in favour of residence inland or at a high level; Dr. Chartres prefers an inland site in place of the seaside. The writer has for many years been of the opinion that old tropical residents coming to Britain should avoid seaside resorts and get to high dry ground in Yorkshire or Derbyshire, in Aberdeenshire (Braemar and neighbourhood), in the upland districts of Banffshire, or anywhere in Moray or Nairn, even at the seaside, for in these two counties the Moray Firth is not sufficiently wide to influence the lightness of the air which prevails around the adjacent hill districts of these counties and the opposite shores of Rossshire and Sutherland. All will agree that the west coast of England, Wales, Scotland or Ireland are unsuitable for persons suffering from malaria or from anæmia from any cause.

Quinine taking when there are no Malaria Para-

sites to be found in the Blood.—Major Graham, Major Stodart and Dr. Villejean are of opinion that no quinine need be taken when the tropical resident, who has had malaria and may have been invalided in consequence, reaches Europe; on the other hand, Dr. Chartres recommends 5 gr. twice weekly, and Dr. Landsborough one dose of quinine weekly for two months. Had the question been made to include enlarged spleen it is to be presumed all would recommend quinine to be taken.

The question of the presence or absence of malaria parasites in the blood cannot be considered a reliable indication whether the patient is suffering from malaria or not, unless the examination is done repeatedly, and perhaps only at times when fever has actually developed. Of many scores of blood specimens from patients invalided for malaria, and many of whom have occasional attacks of malaria after reaching Britain, examined for me by Dr. G. C. Low, in only 4 per cent. have malarial parasites been found. Enlarged spleens have been present in 15 per cent. of those examined, yet in these parasites are absent from the blood as a rule. The absence may be explained by the patient having taken quinine recently, but in many instances this explanation does not hold good. Dr. Low, in his reports, frequently states "the specimen gives all the indications that it is a malarial blood, but no parasites are to be found." The patient is always anxious to know the result of the blood examination, and if told no malaria parasites were found he is satisfied that all is well with him; a subsequent attack of fever at an early date proves disconcerting, and the inevitable remonstrance follows to the effect "that he was misled by a faulty report." It is unfortunate, but nevertheless it is so, that the absence of malaria parasites from a blood specimen is no proof that the patient is free from the disease, and it would seem advisable to administer quinine after arrival in Britain for some three months. The periods of administration and the dosage are matters of choice, but at least 40 gr. per week would seem the minimum likely to do any good.

Intestinal Ailments.—A subacute or chronic state of bowel complaint due to residence in the Tropics is the usual form in which intestinal ailments are met with in Britain. The period at which it is considered advisable by the contributors for patients to come home is the late spring or early summer—April or May; and there seems little doubt that most observers will agree with this decision. The question whether the patient should go inland or to the seaside is replied to by Dr. Villejean with a "query"; Dr. Chartres advocates high inland ground; Dr. Landsborough considers the seaside beneficial at first. The writer finds that intestinal ailments, in common with hepatic ailments, are not only not benefited, but are positively made worse by residence at the sea-level, and he agrees with the opinion that the patient

ANSWERS TO CIRCULAR INQUIRING WHERE IT IS BEST FOR PERSONS TO GO WHEN LEAVING THE TROPICS FOR THEIR HEALTH OR FOR CHANGE.

When malaria is present.	I	II	III	IV	V
(1) Do you consider the summer or winter the better time to reach "home"?	Summer	Summer	Summer	Winter	Summer
(2) Do you advise a sojourn in South of Europe before coming to Britain?	No	No	Yes	No	Yes, Mediterranean shore
(3) Do you consider residence, with winter sports, in Switzerland, beneficial or otherwise?	Beneficial	Yes, after a spell of residence at home	Likely beneficial	Beneficial	Not beneficial
(4) Do you advise residence by the sea, inland, or at a high level whilst in Britain?	Inland	Inland and fairly high level	Inland and high level	East Coast or dry upland	Seaside
(5) Do you advise continuance of quinine taking whilst in England if no malaria parasites are found in the blood?	5 gr. twice weekly	No	1 weekly dose quinine for 2 months	No	No
When suffering from intestinal ailments.					
(1) When intestinal ailments (not acute) are present do you advise sojourn in the South of Europe before coming to Britain?	No	—	Yes	—	Yes
(2) Do you consider the seaside, inland, or high ground residence the best?	High inland ground	—	First seaside	—	?
(3) What period of the year should persons with intestinal derangements come to Britain when the disease is not acute or symptoms pronounced?	Late spring	—	Early summer	—	Spring
(4) What do you consider the period of leave necessary for convalescence when a chronic affection of the bowel is gradually improving?	6 months at least	—	1 year or 4 to 5 months after symptoms gone	—	?

I—E. A. Chartres, F.R.C.S.I., West African Medical Staff.
II—Major James Drummond Graham, Indian Medical Service.
III—David Landsborough, M.B., C.M., Shoka, Formosa.
IV—Major Stodart, Indian Medical Service.
V—Dr. A. A. Villejean, Hôtel Dieu, Paris.

should reside on dry fairly high ground. As milk by many practitioners is considered an essential element in treatment, these patients should be treated in the country, where it is possible to obtain it before it is " tampered with " in any way. The milk in towns is not calculated to benefit sprue patients or others to whom milk is being administered.

The length of leave is " queried " by Dr. Villejean; Dr. Chartres considers six months' leave essential; and Dr. Landsborough advances a plea for twelve months, or four to five months after symptoms and signs of the complaint have completely disappeared. There can be no definite time fixed for return in intestinal ailments, for the time it takes to " cure " is quite impossible to state, and it is only when several months after signs and symptoms have disappeared and the patient has regained his normal weight that he should be allowed to return to the Tropics.

Many subscribers to the Journal must have the schedule issued in their hands, and after the replies received and the remarks made perhaps they will be induced to contribute their experiences upon this interesting subject.

J. CANTLIE.

Abstracts.

ACCOUNT OF AN INVESTIGATION OF THE PREVALENCE OF ENDEMIC KALA-AZAR IN THE PLAINS OF ASSAM.*

By Captain T. C. McCombie Young, I.M.S.
Deputy Sanitary Commissioner, Assam.

THE author believes that a short account of the past history of kala-azar in Assam may be of interest. He therefore recalls the main facts of the epidemic of the 'eighties and 'nineties. In the Province of Assam the disease was first observed in the Garo Hills in 1869, and in 1882 a severe form of " malarial cachexia " was described as affecting certain areas at the foot of the Garo Hills. This was believed to have first become operative as a source of deficiency of revenue in 1875. This fever was probably identical with the epidemic of Burdwan fever, which devastated the Burdwan division in the decade 1860-1870, and the district of Rangpur in 1871-1876; and it was probably a late extension of this epidemic, which had slowly crept round the barrier of the Garo Hills, having been imported from Rangpur. The disease having thus obtained a footing in Goalpara, then spread up the Brahmaputra Valley *via* the grand trunk road, on the south bank of the river, through the sub-divisions of Dhubri and Goalpara to Kamrup, causing the heaviest mortality in Goalpara during the period 1882-87. Kamrup on the southern bank being infected, the disease then crossed to the north bank into the Mangaldai sub-division of Darrang, and thence to Nowgong in 1890. Heavy mortality occurred, especially in the latter district.

As a measure of the disastrous effects of the disease, it may be noted that in Nowgong the fever death-rate rose from about 4,000 in 1891 by regular stages to 14,000 in 1897, and again declined to about 4,000 in 1902. It is calculated that 54,000 persons, or one-third of the indigenous population, died in this district during the epidemic decade, and that one-fifth of the land went out of cultivation. By 1896 the disease had reached the narrow tract of sparsely populated country which gives access to the more open, alluvial plains of the Golaghat sub-division and the Upper Brahmaputra Valley. Here stringent measures to prevent infected persons from traversing this tract of country were put in force; the epidemic was stayed, and the Upper Assam Valley was saved from its ravages. Subsequently, the disease in its epidemic form declined almost to extinction in the parts first affected, and in 1901 it was considered that Goalpara and Kamrup were free from the epidemic, except for a few chronic cases in parts of the district.

In reviewing the history of the epidemic in Assam, the author notes that the disease took from ten to twenty years to go through its epidemic cycle in a district, and that it spread as far as, and no farther than, the Golaghat sub-division of Sibsagar. In the Surma Valley different conditions prevailed. Although a severe outbreak of fever, with a rise in the fever death-rate, occurred in 1897, following the earthquake, the fever death-rate fell to nearly normal proportions the following year, and the rise was probably malarial, therein differing from the ten to twenty year wave-lengths of the epidemic curves in the districts affected by kala-azar. Furthermore, it had previously been shown that the disease was endemic in this district. The contrast between the heavy mortality caused by the disease in the Brahmaputra Valley and the lightness of its incidence in the Surma Valley is one which is very striking, and the explanation put forward by Rogers is of great importance and interest. In this connection Rogers says: " The epidemic travelled through the virgin soil of the northern valley previously unaffected by the sporadic form of the disease, and there found a population fully susceptible to its deadly influence, and hence was able to work such terrible havoc. If this view of the epidemic is correct, it is clear that unceasing vigilance must continue to be exercised to protect the unaffected upper part of the Assam Valley from the insidious extension of the disease, while a fresh outbreak may, in the future, be lighted up by some such extraordinary succession of unhealthy years as caused the spreading epidemic at the foot of the Garo Hills in 1875."

The subsequent history of kala-azar in the province has not been marked so far by any epidemic recrudescence, or by epidemic invasion of hitherto unaffected country. Officers of the Medical and Sanitation Departments, however, have, within the last three years, been reporting the existence of

* Proceedings of the Third Meeting of the General Malaria Committee, held at Madras November 18, 19, and 20, 1912. Simla: Government Central Branch Press, 1913.

certain areas within which it appears as if some still glowing embers of the disease, remnants of the epidemic conflagration, are displaying activity. In the maintenance of that unceasing vigilance advised by Rogers, early and careful scrutiny of the conditions attending any such apparent activity is imperative; and from the first the importance of doing so has been recognized by the Sanitary Department.

The author then gives a short account of the situation in certain of these areas in which the apparent activity of the disease has attracted attention, and in which some preliminary work has been done prior to the commencement of the larger survey.

Golaghat.—It was in this sub-division of the Sibsagar district that the epidemic conflagration burnt itself out, and it was with regard to this area that the need for future vigilance has been emphasized. Beyond this region, amid the higher reaches of the river, lie the fertile and prosperous districts of Sibsagar and Lakhimpur. These districts are the seat of a large and flourishing tea industry. The protection of this industry, involving as it does very large financial interests, and one upon whose continual prosperity the livelihood of a large population depends, an industry, furthermore, to whose vitality and energy much of the prosperity and advancement of the province in the past is to be ascribed, and in whose hands much of the future industrial prosperity of the province lies, is probably one of the most important problems to be considered by the sanitary advisers of the Assam administration. Any suspicious disease activity in a fringe of country bordering on these hitherto unaffected and populous districts would give rise to some anxiety. During the rainy season of 1910, the attention of the Civil Surgeon, Captain Morison, I.M.S., was directed to persistent reports of deaths from kala-azar occurring in the Khumtai Mauza. These had previously been filed as fallacious and included in the fever mortality returns. On visiting the affected area, however, Captain Morison was convinced of the truth of the reports, and notified the existence of the disease to the Sanitary Department. Measures for dealing with the outbreak were drawn up by the Acting Sanitary Commissioner, and the author was deputed to investigate the conditions.

His observations confirmed those of the Civil Surgeon, and the parasite was found in a *post-mortem* specimen of the spleen of one of the cases.

Major Christophers, I.M.S., was then deputed by the Government of India to examine the outbreak. In the report which he submitted he stated that the disease had probably been introduced into the district ten (or more) years ago, and that it had progressed irregularly from the original foci, showing the typical tendency of the disease to cling to groups of houses and families. He considered that there was no great tendency for it to assume epidemic proportions at present, and he was doubtful as to whether it was really more prevalent now than some years ago.

He pointed out, however, that the infection is maintained by the presence of these secondary foci, and that so long as these exist it is impossible to say when the disease may not assume an active epidemic form.

The results of a survey, which was carefully and thoroughly carried out under the personal supervision of the Sanitary Commissioner, the Civil Surgeon, and the author of this paper, showed that the infection was not very widespread, and their view was that there was no cause for anxiety as to the present condition of affairs, although the situation required vigilance.

The measures adopted to deal with the cases are as follows: When an undoubted case is discovered in a family, a new house is built for them on another site at Government expense, and compensation is given for the destruction of presumably infected belongings before removal under the supervision of the Assistant Surgeon in charge. The infected person is provided with separate quarters on the new site, but within the compound of the house, and is prohibited from sleeping or eating with healthy persons. This degree of segregation is merely nominal, and, as may be expected, has not proved effective.

Probably, the author believes, the solution of the difficulty will be to provide a kala-azar hospital or dispensary with indoor wards for treatment of diagnosed cases. The nucleus of such already exists at Khumtai.

Kamrup.—Another investigation has been in progress in the district of Kamrup. This district was involved in the epidemic conflagration and is known to contain endemic foci. In March, 1911, the Civil Surgeon, Kamrup, drew attention to the prevalence of the disease in a village in the thana of Rangiya in a report suggesting certain measures to deal with the disease. A Sub-Assistant Surgeon was placed on duty for a year to carry out the measures recommended by the Civil Surgeon under his supervision. He carried out investigations as to the extent of the infection, and destruction of infected property was attempted, but without the thoroughness attending the Golaghat measures. Fourteen villages were found to be infected out of sixty-seven examined.

Sylhet.—It was observed that a considerable number of deaths from kala-azar had been reported from the Chatak and Sadar thanas of Sylhet in 1910, and the attention of the Civil Surgeon was drawn to it, and a Sub-Assistant Surgeon deputed to assist him in the investigation. On looking up the past history of Sylhet with regard to kala-azar, it was found that the presence of the endemic form of the disease had been established by several observers.

Goalpara.—Attention was drawn to yet another affected area by the Deputy Commissioner of Goalpara, who reported that in the Dudnai thana during the twelve months from March, 1911, to February, 1912, 113 deaths from kala-azar had been reported, and he remarked that "considering the extraordinary virulence of previous epidemics of kala-azar in neighbouring parts of the district in previous years these figures are serious."

Mangaldai.—The Sub-Divisional Officer of the

Mangaldai sub-division of the Darrang district has recently reported the prevalence of kala-azar in the Ambagaon Mauza, in which the Mauzadar reports the presence of ninety cases.

From the foregoing account it will be seen that the presence of endemic foci of kala-azar is tending to attract attention. There is no reason to believe that this increased attention is due to any tendency of the disease to assume again endemic proportions. But it must be remembered the author states that the rate of kindling of the epidemic fire is very slow and the time it takes to burst into flame is measured by years. Where in other parts of India the advent of plague or outbreaks of epidemic malaria are perils to be feared, in Assam kala-azar is perhaps the greatest potential menace to public health, for any recrudescence of the epidemic of the 'eighties and 'nineties would be a disaster of the first magnitude in that country.

The situation at present appears to be this—that in an unknown number of areas in the Lower Brahmaputra Valley and throughout the Surma Valley, there are still glowing points of slow-combustion endemic foci. Further more, in the Upper Assam Valley, which is the main centre of the important tea industry, there exists a population so far untouched by the endemic form of the disease, and hence presumably a rapidly combustible material for an epidemic fire, and that adjacent to this inflammable material there exists in Golaghat an area of combustion of not inconsiderable activity. The situation, while it cannot be considered to be fraught with any immediate danger, is one, however, that requires vigilance.

QUARTERLY REPORT OF BUREAU OF HEALTH FOR THE PHILIPPINE ISLANDS.

By Victor G. Heiser, M.D.

First Quarter, 1913.

Heiser, in the above report, states that it is satisfactory to be able to say that during the month of January there were only 502 deaths, as compared with 698 for the same month of the previous year; during February there were 445 deaths, as compared with 611 for the year before; and during March there were 451 deaths, as compared with 732 for March of last year. When it is remembered that the population of the city is constantly increasing, it will be apparent that the improvement is even greater than the numbers indicate. The above figures also mean that, for the first three months of the year, all mortality records for Manila since American occupation have been broken.

The decrease in the number of deaths is largely attributed to the improved city water supply and the more general use of the new sewer system. The many other sanitary reforms which have been brought about, as, for instance, the proper collection and disposal of garbage, the reduction in the number of mosquitoes, the rejection of unwholesome food, regulation of the milk supply, sanitary houses, the prompt isolation of dangerous communicable diseases, and many other factors, are also no doubt responsible to a large extent for the improvement in the public health.

During the quarter there were collected and transferred to Culion 264 lepers. The majority of these came from the island of Cebu, which province still continues to furnish over half the lepers encountered, in spite of the fact that it contains only approximately one-tenth of the population.

A systematic effort to collect all of the lepers from the Moro Province was also made during the quarter. The experience there was the same as that heretofore encountered in other parts of the Philippines in territory in which the first leper collection had not yet taken place; namely, large numbers of persons were brought in as lepers who on close examination proved to be afflicted with other diseases. It is satisfactory to report that a considerable percentage of these cases can be cured, and when they return to their homes they will once more take their places in the community without being shunned by their fellow-men.

During the quarter human plague continued in a sporadic manner, there being two cases in January, four cases in February, and two cases in March, or a total of eight cases in all.

The infection has been confined entirely to that portion of Manila on the north side of the Pasig River. In spite of extensive rat catching done on the south side, no plague rats have been found. Half of the cases occurred in persons under 16 years of age, all of whom were boys. 11,579 rats were caught during the quarter. Of these thirteen only were plague infected. It is also noteworthy that with two exceptions all of the plague rats were found during March in the district of Tondo, which is bounded by the following streets: Peñalosa on the north, Anloague on the east, Moriones on the south, and by Manila Bay on the west.

An investigation made of the premises upon which plague-infected rats were found showed that many of them were establishments in which straw containers used for packing bottles against breakage during shipment are stored. For instance, at No. 319 Estero Cegado it was found that the bottling of olives, pickles, wines, &c., which came from Spain in bulk was being done with bottles from Japan, and that these were shipped in straw containers that also came from Japan, and originated in places where rat plague prevailed. At a soda-water establishment in Tondo in which plague-infected rats were found, investigation showed that bottles packed in straw containers that came from Japan were used. An investigation made of goods imported into the Philippines shows that rats are not infrequently brought in in straw matting and in curios packed in straw which come from Japan and India.

From the foregoing it would appear not improbable that perhaps Manila has been repeatedly infected since the original infection was discovered, during June, 1912.

Plague at Malolos.

On March 22 a case of plague was discovered at Malolos. Investigation showed that the victim had left Manila on or about March 18 and came from No. 12, Calle Aguila, which is in the vicinity of Nos. 204 and 232, Calle Concha, where plague-infected rats had been found. On March 28 another case, in the person of a girl, who had been ill over a week, was discovered at Malolos, which came from the same house in Manila as the first case. The two were found in widely-separated sections of Malolos and apparently had no connection with one another after their arrival in that town. A rat campaign was immediately begun and has continued for over a period of two weeks, but so far no plague-infected rats have been found. Both of the cases occurred well within the incubation period of the disease, so that there is every reason to believe that the infection was contracted in Manila.

In order to combat the rat plague of Tondo the plan of campaign has somewhat changed. Instead of the greatest stress being laid upon the actual catching of rats, the principal thing kept in mind at present is to destroy rat nests, and then to catch as many rats as possible and rat-proof the premises. One gang of labourers composed of about 100 men is divided into three small sections, each under the charge of an experienced sanitary inspector, and these go from house to house and make a thorough systematic search for rat-breeding places. After the search of the house proper is completed, the yards, woodpiles, old junk, rubbish, and everything likely to harbour rats are moved about so that the rat nests may be discovered and destroyed. Particular attention is given to spraying with an insecticide so that the fleas may not escape. In this way an enormous number of rats are also caught and the chances of catching those that are likely to be infected are very much increased. It is thought that by constantly changing the places of abode among rats there is less likelihood of the disease spreading among them, and also that the chances of plague-infected fleas that have come from rats dying in rat nests gaining access to human beings are very much reduced.

In view of the great importance that has been attached by the Javanese sanitary authorities to destroying rats in hollow bamboos, special stress has been laid upon finding similar breeding places in the Philippines; but in spite of the fact that this was constantly kept in mind, it was only recently that rats were actually found in bamboos. In a house located at 140, Calle Perla a man was found dead with plague. In a piece of bamboo in which the partition of the first joint had been gnawed through a mummified rat that had apparently died of plague was found. The bamboo was placed horizontally near the head of the cot on which the man slept, and it would appear probable that the plague-infected fleas on the death of their host left the bamboo and attacked the man.

Annotations.

Experimental Oriental Sore in Mice.—In the *Archiv für Schiffs- und Tropen-Hygiene* for June, 1913 (pp. 397-403), Richard Gonder describes the successful inoculation of mice by means of cultures of *Leishmania tropica* of Oriental sore. It was found that infection was most likely to occur when the parasites were in the flagellate condition, and the most interesting point of the experiments is that infection was produced by inoculating the animals either intra-peritoneally or intra-venously. A month after such an inoculation Leishmania were found in the liver by liver puncture. This organ, together with the spleen, which was also infected, became much enlarged. In spite of this the animals remained apparently healthy for about four months, after which some of them became ill and died, when large numbers of parasites were found in the liver and spleen, but not in the bone-marrow. In other mice which did not die at this stage there commenced to develop œdematous swelling of the feet, which on puncture exuded a serous fluid containing many Leishmania in pure culture. Later these swellings broke down and developed into necrotic ulcers, while similar lesions appeared on the tails and about the mouth of some of the animals. In all these peripheral lesions Leishmania occurred. In only one case has the author been able to produce a sore by local inoculation in the skin of virus obtained from another mouse. With cultures of *L. infantum* of Mediterranean kala-azar injection of the liver and spleen of mice was produced, but the disease differed in that peripheral lesions did not develop as in infections with *L. tropica*. The author suggests that in man Oriental sore is possibly at first a general infection as in mice, and that eventually the lesions typical of the disease develop peripherally on the skin. The long incubation period of this disease appears to him to be in favour of a preliminary stage of general infection which has not hitherto been recognized.

Dogs successfully inoculated with Leishmania donovani *in India.*—In the first number of the *Indian Journal of Medical Research* (July, 1913), both Lieut.-Colonel Donovan and Captain Patton record the successful inoculation of dogs with *Leishmania donovani* from the spleens of cases of kala-azar. Donovan inoculated a dog intra-hepatically with 3·5 c.c. of splenic blood taken by puncture from a case of kala-azar. Three months later the dog was killed and Leishmania were only found in the smears of bone-marrow. Patton inoculated a large series of animals (3 monkeys, 4 dogs, 2 jackals, 2 guinea-pigs, 2 rabbits, 2 cats, 4 white rats, 1 young goat, 1 young pig, and a calf) on two occasions, with an interval of about a fortnight between the inoculations, large doses of virus being injected each time. The three monkeys all became infected and died within two months of the first

inoculation. The four dogs also became infected, two dying four months and two about nine months after inoculation. One of the jackals died nine months after inoculation and was found infected. The jackal and two of the dogs became infected with *Piroplasma canis*, and this probably hastened their death. The white rat died two hours after receiving the second injection, when many parasites were found in the liver and spleen. It is interesting to note that in the dogs and the jackal Leishmania were encountered in the peripheral blood a few days before death. The successful inoculation of dogs with the parasite of Indian kala-azar does away with this supposed difference between Indian and Mediterranean kala-azar. Patton also records the examination of the spleens of 1,438 dogs destroyed in the lethal chambers in Madras from January 29 to November 25, 1912, and the spleens and bone marrow of 1,321 dogs between November 26, 1912, and May 16, 1913. In no case was a dog found to be naturally infected with Leishmania. Dogs in the endemic centres of kala-azar in India do not appear to suffer from kala-azar as they do in the Mediterranean districts.

The Indian Journal of Medical Research.—This publication, the first number of which appeared in July of this year, is to be the official journal of the Indian Research Fund Association. It is to be published four times a year, and is to replace *Paludism* and the *Scientific Memoirs*. Formerly there was in India no periodical devoted entirely to the publication of research work connected with sanitation and the prevention of disease. Most of the papers, therefore, on this very wide range of subjects either remained more or less buried in the files of the Government offices, found their way into the general medical or surgical press, or were scattered over a variety of very specialized journals in England or Europe. It was long felt that a periodical which would collect the best of all this work and publish it in a readily accessible form would be eminently desirable and meet a real want. It is to meet this want that the *Indian Journal of Medical Research* has been started. The first number contains 211 pages. Patton (W. S.) and Cragg (F. W.) contribute two papers on certain hæmatophagous species of *Musca* and a new species of *Philæmatomyia*. Howlett (F. M.), the Imperial Pathological Entomologist, gives an account of investigations into the habits of *Phlebotomus minutus*, which he shows to be primarily a parasite of lizards, on which it feeds in preference to any other animal. Greig (E. D. W.) publishes four important papers on the subject of cholera, with reference to the occurrence of the cholera vibrio in the biliary passages, cholera convalescents and contacts in India, an epidemic of cholera caused by a "carrier," and the occurrence of the comma bacillus in the urine of cases of cholera. Cunningham (J.) contributes an interesting *résumé* of our present knowledge of dysentery, both bacillary and protozoal; MacGilchrist (A. C.) a paper on the hæmolytic action of quinine and its salts, with suggestions regarding the etiology and treatment of blackwater fever; and Acton (H. W.) and Knowles (R.) one on the diagnosis of latent malaria. Donovan (C.) discusses kala-azar in reference to its distribution and probable modes of infection, and records the successful inoculation of a dog with *Leishmania donovani*. Patton (W. S.) records a series of inoculation experiments in which he has successfully infected dogs, monkeys, a jackal, and a white rat with *L. donovani*. Acton (H. W.) and Knowles (R.) have a paper on the specific gravity of the blood, Strickland (C.) a revised list of Malayan anophelines, and Knowles (R.) and Acton (H. W.) a note on Kurloff's bodies, in which they give very good reasons for regarding these structures as cell inclusions of a non-parasitic nature.

The first number, which is full of interesting and important matter, is well got up, the paper and printing is good, and the annual subscription of six rupees for India and ten shillings for foreign subscribers bears out its claim that the price has been fixed at a very low rate.

The Life-cycle of Clonorchis. — In the *China Medical Journal*, May, 1913, Houghton writes on the life-cycle of *Clonorchis*. His paper gives the preliminary results of an attempt to show the direct source of infection by this parasite.

Houghton states that in *Opisthorchis felineus* (a common parasite of man in Siberia), Askanazy is said to have worked out the post-embryonal development. According to his researches on cats and dogs, the first intermediate host for this species is a chub (*Idus melanotus*) and a second host the roach (*Leuciscus rutilus*). Lühe states more recently that the details of development are but meagrely known, and suggests that an encysted larval form found in north-east Prussia to infect the flesh of *L. idus* and *L. rutilus*, may be the cercarial stage of this species. An earlier stage, he thinks, may be passed in the body of *Dreissena polymorpha*, a small bivalve mollusc.

There seems to be no question, however, but that the final larval stage — the one infective for the mammalian host—is passed in some species of fish. The abundance of this parasite in human cases in areas where fish are not only a staple article of diet, but are often eaten raw or insufficiently cooked, and its frequent association with *Dibothriocephalus latus*, points significantly to the probable source of infection.

It is likely, considering the close relationship of the two genera, that *Opisthorchis* and *Clonorchis* have a life-history that follows in general the same course. In the summer of 1910, in the course of making some observations on parasites present in the ordinary foodstuffs of the Chinese dietary, Houghton noticed the practically constant presence of a larval trematode in the intestine of a small fish much eaten in central China, and thought of the possibility of its being some form which might parasitize man, or at least some mammalian host. The larvæ were found lying singly in the folds of the intestinal mucosa They were best obtained for study by removing

the intestine from the fish, cutting off the upper and lower portions, and then gently removing the intestinal contents, by stripping the mucosa from the gut. The free mucosal elements milked out in this way, were diluted slightly with normal saline, and examined under the low power of a microscope. The larvæ themselves were small distome cercariæ, 0·4 mm. in length, tailless, without cuticular spines, and showing the anlage of digestive and generative organs similar to those found in adult fasciolids. This was the only trematode organism found in these fish, either in the intestinal canal or encysted in the flesh.

Three series of experiments were carried out, but then unfortunately the investigation had to be dropped for the time being.

(1) In the first series, two suckling kittens were used, which after forcibly weaning were put into separate cages. The experimental kitten was fed for a period of about two months on a diet of boiled rice, raw fish of the variety under investigation, and tinned milk. The control was kept on the same diet minus the fish. At the end of the two months' period the kittens were killed. On section, the experimental kitten was found to be infected with *Clonorchis endemicus*. The control animal was free from this parasite. Not satisfied with the technique, the experiment was repeated under the following conditions:—

(2) A cat with two suckling kittens was put into a specially built cage and fed upon sterile food until the kittens were weaned and able to eat freely of the boiled rice and tinned milk. The floor of the cage was covered with sand sterilized previously by baking, and changed daily. After weaning, the kittens were removed to separate cages and kept under the same conditions of sterile food, &c., but the experimental kitten was fed daily with the intestines of the fish which were carefully removed from freshly-killed fish and mixed with rice. Examination of the droppings at the beginning of the experiment showed absence of trematode ova, though the eggs of some unidentified nematode worm were found in both kittens. At the end of two months both kittens were killed and sectioned. The control was free from trematode infection, but on opening the experimental animal the abdominal cavity was found to be more than half filled by an enormously large liver. The bile ducts were so distended as to be easily visible on the surface of the organ, and the gall-bladder and common duct were much dilated with thickened opaque walls. The common duct was very tortuous. Over a hundred specimens of *Clonorchis* were allowed to escape from the cut end of the duct before tying it off.

Another finding of interest in this animal, though not pertinent to the present paper, was a cystic diverticulum of the stomach wall connected with the lumen of the stomach by a minute opening, which contained twelve specimens of *Gnathostomum*.

(3) A third series conducted under similar conditions gave a negative result, both kittens dying of some intercurrent disease at the end of a month's time.

While the experimental work above outlined is too scanty to form a basis for sound conclusions, the author, nevertheless, feels justified in saying that it suggests the probability of infection with *Clonorchis* by a free-swimming cercaria which is to be found in a small cyprinidine fish of the genus Notropis. The fact that fishes of this character are commonly eaten uncooked in Japan where clonorchiasis is very frequent, and occasionally eaten inadequately cooked in China, where in certain areas infection is not uncommon, and the further fact that about 90 per cent. of Chinese cats—notorious fish-eaters—harbour the parasite, all seem to point to the possibility of this source of infection.

Plague in Manila.—Goff, writing in the *Journal of the American Medical Association*, June 28, 1913, states that after an absence of six years plague again appeared in Manila in June, 1912. Between that date and the present—March, 1913—there have been fifty-five cases, twenty-two of them having occurred in October.

The way in which the disease entered Manila is not known with certainty, but as there had been a good deal of plague in China for some time before June, 1912, it is presumed that an infected rat came ashore from some boat from the mainland. It is impossible to guard against this danger absolutely. In the rat-poisoning and rat-catching operations which have been carried on, remarkably few infected animals have been found, which, of course, accounts for the comparatively few human cases reported, and leads to the belief that no serious epidemic will occur in Manila. All of the cases, except two in the Walled City (Intramuros), have been on the north side of the Pasig River, which divides the city; and nearly all of the twenty-two mentioned as occurring in October originated in an infected store-house near the station of the Manila and Dagupan Railroad. This was, of course, at once thoroughly disinfected and cleared of rats, and since then no more cases have occurred in that neighbourhood. It might be mentioned, in this connection, that arsenic mixed with rice in such proportion that a few grains of rice constitute a poisonous dose, is considered to be the best rat-poison in Manila. The fifty-five cases according to nationality were divided as follows: In Filipinos forty-six, Chinese eight, and Caucasians one. Only ten females were attacked, and the ages of all patients varied from 16 months to 50 years; about one-half being 25 years of age or under.

According to the population the number of cases was somewhat greater among the Chinese than among the Filipinos, and among the Caucasians somewhat less than the due proportion.

All cases of plague are handled at the San Lazaro Hospital, and every diagnosis is confirmed by laboratory methods, or by *post-mortem*, or both. When a case is admitted, the bubo, if there be one, is aspirated, and a smear examined at once, by which means the diagnosis in typical cases is usually confirmed. Of course a culture is also made, and guinea-pigs inoculated. This is done by the

Government laboratory. This work of the laboratory is particularly useful, from a practical standpoint, in doubtful cases of enlarged lymph-nodes. Many cases are sent as suspected bubonic plague, with enlarged lymph-nodes, high temperature, &c., which are not plague. It is practically impossible to be sure of the diagnosis in these instances, for a day or two, and here the microscope is particularly valuable as giving, at least, negative evidence. Of course these cases of enlarged lymph-nodes do not closely simulate typical plague clinically, but many cases of true plague are not typical

The following is the description of a non-typical case of plague:—

"A male Filipino, aged 18, was admitted with a temperature of 104° F., and slight enlargement of the lymph-nodes in the left axilla. A lymph-node was aspirated, and nothing was found indicative of plague in the smear or culture. The patient was given quinine and calomel, and the temperature become normal on the day after admission, and remained practically so for two days. On the fourth day, however, the temperature rose again to 104° F., and a second aspiration of the lymph-node showed the case to be plague both in smear, culture, and guinea-pigs. The temperature declined again in a few days, and the patient recovered. This case was, of course, bubonic plague in a mild form, but there was nothing at first to differentiate it from some of the cases admitted which were not plague, as, for example, the following:—

"A Filipino child, aged 4, was brought in with a temperature of 104° F., and a large left femoral bubo. The lymph-node was aspirated repeatedly, but nothing could be found in smear, culture, or guinea-pigs. There was no infection of the foot or leg to account for the bubo, and according to the mother there had been fever for some days before the lymph-node enlarged."

In the cases observed in Manila the femoral lymph-nodes have been oftenest primarily enlarged, followed in frequency by the inguinal; in two cases the popliteal lymph-nodes were affected, in three the cervical, and in three the axillary. In only two cases has there been any skin eruption. Three or four cases developed bloody expectoration due to secondary involvement and congestion of the lungs. Specimens of sputum were found to contain immense numbers of the plague bacillus. These cases were, of course, in no way genuine pneumonic plague, all having been of the bubonic type; but as there was usually more or less coughing, every person going near these patients was compelled to wear a mask of absorbent cotton, between double layers of gauze, over the nose and mouth. In addition, when practicable, a light towel or piece of gauze was thrown over the patient's face when it was necessary for anyone to remain near him for any length of time. When individuals reach this stage they are usually practically unconscious, so that a light covering over the face causes no annoyance.

The patients were treated with serum prepared at the Government laboratory; about 150 c.c. being given by intramuscular injection as an initial dose, and from 50 to 75 c.c. three or four times a day until 500 c.c. had been administered. This treatment had not been used a sufficient length of time to make any positive statement as to results possible, but it was believed that it had a beneficial effect.

Notes and News.

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

At the first ordinary meeting of the Society of Tropical Medicine and Hygiene for the new Session, 1913-1914, held at 11, Chandos Street, Cavendish Square, London, W., on Friday, October 17, 1913, at 8.30 p.m., the President, Sir R. Havelock Charles, delivered his Presidential Address on "Neurasthenia and its Bearing on the Decay of Northern Peoples in India," the paper being followed by an animated discussion.

At a ballot the following candidates were elected Fellows of the Society:—

Orrock Arnott, M.B., Basutoland.
Daniel Birtwell, L.R.C.P. and S. Edin., Durban.
Captain F. Powell Connor, F.R.C.S., I.M.S., Calcutta.
C. Noel Davis, M.B., Shanghai.
Geoffrey Dunderdale, M.D., M.R.C.S., Nairobi.
John Dunlop, M.B., India.
P. V. Early, M.B., Canton.
J. Y. Ferguson, M.D., Ontario.
Henry E. K. Fretz, L.R.C.S., St. Kitts, B.W.I.
Captain J. E. H. Gatt, M.D., R.A.M.C., India.
Captain J. B. Dalzell Hunter, M.B., I.M.S., Bombay.
J. L. Keeler, M.D., North China.
Captain Herbert H. G. Knapp, M.D., I.M.S., Burma.
J. W. Lindsay, M.B., Paraguay.
Elizabeth N. MacBean Ross, M.B., Tain.
Charles E. F. Mouat-Biggs, M.R.C.S., Babbacombe.
C. Stanley G. Mylrea, M.D., Bahrein.
H. North, M.R.C.S., Leeds.
L. Dorothy Parsons, M.D., South Kensington.
C. R. Patton, M.B., W.A.M.S., London.
Captain B. B. Paymaster, L.R.C.P. and S.E., I.M.S., Bombay.
Alexander Robertson, M.B., Mombasa.
J. A. Valentine, M.D., Assam.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

HEPATIC ABSCESSES WHICH OPEN UPWARDS THROUGH THE LUNG.

By James Cantlie, M.B., C.M.Aberd., F.R.C.S.

Time was when it was considered advisable to defer operation and to allow a hepatic abscess situated far back in the liver to open upwards through the lung. Knowingly for a practitioner to follow such a line of treatment to-day can be considered neither more nor less than *malpraxis*, for the danger incurred, or the long period which must elapse before possible recovery if it does take place, is wholly unjustifiable. Yet liver abscesses finding exit by way of a bronchus are met with, and in all probability will continue to be so. The reason for the occurrence is readily understood when the clinical phenomena are taken into account. The situation of the pus, at the upper and back part of the liver, is such as to render exact diagnosis well-nigh impossible. Neither palpation nor auscultation help much in the localization, nor can direct percussion be relied upon, for with a hepatitis or with pus impinging on the diaphragm there is always a congestion of the base of the right lung, which renders percussion useless in mapping out the presumed abscess limit. "Presumed" is said advisedly, for we have no means of positively asserting that pus is present when it lies in the substance of, or far back in, the liver. Neither the temperature chart, the presence of night sweats, the history of the case, the character of the cough, X-ray inspections, nor any one symptom or group of symptoms are of avail in determining a positive diagnosis. Finding the pus by a needle is the one and only fact we can rely upon as indicating that we are dealing with pus in the parts of the liver remote from the surface of the body.

That liver abscesses bursting upwards through the lung will diminish in number is to be hoped for, but that they will disappear from clinical practice with our available means of diagnosis cannot be expected. Nay, it may be they will increase, and for this reason: it has long been a belief that by the administration of ipecacuanha in large doses, a hepatitis, associated with or consequent upon dysentery or a liver abscess may be prevented. This is a possible and a probable contingency, and one to be striven after. There is, however, a still further belief engendered by the suggestions of recent observers, namely, that even when pus is forming treatment by ipecacuanha (emetine) may resolve the ingredients by destroying the amœbæ in the inflamed area. The danger is that this treatment may be continued unwisely, may be prolonged even when the abscess, the presence of which is always obscure, has attained considerable dimensions and pushed its way beyond the upper surface of the liver to the interval between the liver and diaphragm, or may have reached the lung, when ipecacuanha will be useless.

To the practitioner imbued with the potency of ipecacuanha and his cherished hope that by its continuance the much-dreaded (both by the patient and possibly by the practitioner also) operation for liver abscess may be put off, it must be remembered that ipecacuanha may fail, and that by the operation being unduly deferred the pus may find its way upwards into the lung or pleura. It is evident that prolonged ipecacuanha treatment is not without its dangers. The situation may be summed up as follows:—

(1) That ipecacuanha (or emetine) should be given in hepatitis associated with dysentery in the hope of preventing pus forming; it is the only known means of doing so at our command.

(2) That ipecacuanha may, by destroying amœbæ, actually cause a threatening intra-hepatic liver abscess to be arrested and to abort is conceivable and possible.

(3) That ipecacuanha can resolve an established liver abscess is to be regarded as improbable.

(4) That pus beyond the liver substance—the supra-hepatic abscess of the writer—situated between the layers of the broad ligament of the liver, can be affected by the administration of ipecacuanha is inconceivable.

(5) The prolongation of ipecacuanha treatment is fraught with danger to the patient under conditions mentioned under (3) and (4).

The transition from the point of safety to that of danger during the ipecacuanha treatment is obscure, and perhaps wholly impossible to define or ascertain. The point at which a local inflammation within the liver passes on to pus is impossible to determine, and it is not until the pus has reached the surface of the liver and caused a local peri-hepatitis, or threatens the lung, that a tangible indication is presented of the possible presence and situation of the pus. When a liver abscess is suspected and a local peri-hepatitis develops the possibility that pus has actually formed may be taken as a working diagnosis and steps for its elimination proceeded with. When the pus takes an upward course, and reaches the under surface of the diaphragm between the two layers of the broad ligament, that is, through the patch on the liver devoid of peritoneum, the pain may be insignificant, and the pus may find its way upwards through the diaphragm and gain the lung in a manner so stealthy that it is only when a cough supervenes that a real indication of the course it has taken is presented. The cough attending the burrowing of pus upwards from the liver to the lung is characteristic. It is at first trying, inasmuch as no relief is obtained thereby. It is deep-rooted, violent, the bouts are frequently repeated, the exhaustion of the patient rather than the result obtained causing some cessation, for the attack quickly commences again, and the result in the way of expectoration is, to begin with, *nil*. After a time, it may be only half-an-hour or several hours, the patient may succeed in bringing up a frothy mucus tinged after a short interval by blood; the sputum speedily becomes more glairy, and then mucopurulent and freely stained by or mixed freely with

blood. Finally, pus (liver pus) predominates, and if the abscess is large it comes away freely. One has to fall back upon that uncertain, but nevertheless often reliable, element in diagnosis—clinical experience, in a matter of this kind; this is a poor factor so far as the beginner is concerned, and it is he that most wants definite statements and rules to guide him.

When Pus has found Exit by the Lung.

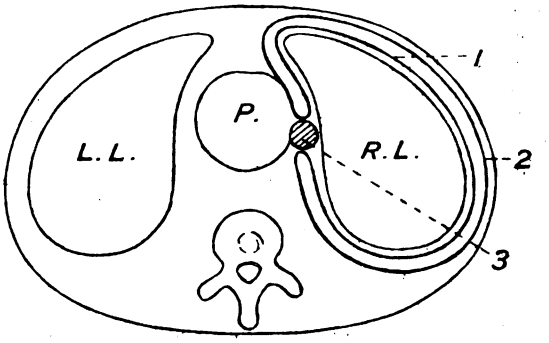
To the experienced the fact that pus has found its way into the pulmonary area is often rendered plain by the character of the cough alone; but when in addition the sputum is affected the diagnosis should be less difficult. The expectoration may be in quantities as much as a pint or two or more in the twenty-four hours. So voluminous may the pus become that it well-nigh chokes the patient, and he has no rest, it may be, for twenty-four hours. The writer has had on more than one occasion to open the abscess transthoracically to save the patient from complete exhaustion and to afford relief from the distress he suffers and what appears to be danger of suffocation. In smaller abscesses, coughing up the pus brings instant relief from the tension, discomfort, and local pain due to the imprisoned pus, the temperature soon falls, and the patient enjoys a period of comfort.

All goes well for a time; only a slight cough continues, and for a week, or it may be six weeks, the patient believes he is cured. Inevitably, however, the symptoms recur; fever comes on again; the appetite is lost; restlessness and insomnia supervene; the cough and what slight expectoration there may have been disappear, and the patient is in a state similar to that in which he found himself just before the abscess opened into the lung. After three days (as a rule) of this relapse expectoration returns, at first consisting of froth and blood, to be shortly followed by pus. This attack passes off, and again the patient has a relapse. The interval between the first and second relapse, however, may be a few months, in place of a few weeks, and the same process is repeated. If left alone indefinite relapses may occur, extending over a year or more, until the cavity is finally emptied. This is what may be termed a favourable ending, but it is not one which the practitioner cares to see occurring, as the patient is not only prevented returning to his employment, but his life is endangered by the continued recurrences.

How does the Pus find its way to a Bronchus?

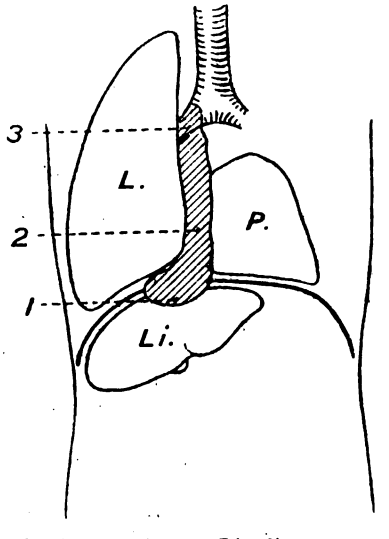
(1) The *post-mortem* examination of a lung through which pus has found its way to a bronchus is often a disappointment, for there will seldom be found a channel leading directly from the liver abscess to a bronchus, but instead the pus would seem to spread within the base of the right lung and widely saturate the lung tissue with pus, and the exact opening into a bronchus it may not be possible to find. The pus occupies the lung tissue as water lies in a bog; here and there a piece of lung tissue crops up amongst a morass of pus. It is usually necessary to pour water into the bronchus at the root of the lung and watch its exit through one of the smaller bronchi to ascertain how the pus reached the air-passages.

(2) Another tract along which pus may pass upwards from the liver to the root of the lung is by way of the ligamentum latum pulmonis. The pus passes up between the layers of this ligament where the channel is bounded internally by the pericardium, externally by the lung tissue, and in front



Section below Root of Lungs showing the Ligamentum Latum Pulmonis.

P., pericardium; *R.L.*, right lung; *L.L.*, left lung; 1 and 2, visceral and parietal layers of pleura; 3, pus from hepatic abscess between layers of ligamentum latum pulmonis.



P., pericardium; *L.*, lung; *Li.*, liver; 1, pus passing through diaphragm; 2, pus passing up between lung and pericardium; 3, pus entering bronchial tube.

and behind by the layers of the pleura, which constitute the ligamentum latum pulmonis.

(3) Hepatic pus may find its way into the pleura occasionally by opening directly into the cavity, or more frequently after first traversing the lung. On reaching the pleural cavity the tendency is for the pus to become localized by setting up a pleuritic barrier around. When hepatic pus, which is so fre-

quently sterile, reaches the pleural cavity directly, there is less tendency for the pus to become localized than when it has first traversed the lung, whereby it becomes germ-laden, and therefore more likely to be confined by setting up local pleuritis.

(4) Pus which has penetrated the diaphragm from the liver reaches most frequently, perhaps, the space below the pleura and between the diaphragm and the ribs, where the loose areolar tissue alone fills the interval, and where the lymphatics travel directly between the diaphragm and the chest wall, and no doubt favours the pus reaching the chest wall. This explains why, when operation is delayed, the pus is found directly beneath the ribs and without the pleura being involved.

Operations when Pus has entered the Thoracic Cavity.

It is a simple matter to find the pus when it lies immediately beneath the ribs, but it is a serious matter to reach the channel of its exit when the tract is close to, or actually in contact with, the pericardium.

There is a difference also as regards the course of the ailment, according as the pus passes through the lung tissue on its way to the bronchus, or opens directly between the layers of the ligamentum latum pulmonis. In the former the pus, being scattered in the lung tissue, as in a bog or morass, tends to hinder the abscess emptying itself thoroughly; whereas, with a clear channel to the bronchus by way of the broad ligament of the lung, the pus has free passage and exit; the result is that in the former pus will continue to appear between the lung and the liver, and the cavity in the liver will tend to continue and refill from time to time; whereas in the latter the actual abscess in the liver will tend to heal, but the test-tube-like channel between the layers of the ligament of the lung will persist indefinitely unless it is actually reached and opened.

(1) When the pus has passed through the lung tissue the time to operate is during a relapse. As noted above, the first exit of pus is followed by a temporary cessation of symptoms, and the patient seems "cured." A relapse is well-nigh inevitable in a week or after several weeks; and it is during the relapse that there is any hope of reaching the abscess cavity by operation or of striking pus by a needle. The first relapse usually takes place whilst the patient is convalescing and has often left his doctor's charge for a change. When the symptoms recur the patient usually lies up for a day or two, the pus is coughed up, and the fever and all signs and symptoms again disappear. When this is reported to the doctor, the patient must be told on the next recurrence of fever or pain, &c., to report the matter, and the doctor should at once, whilst yet the fever and pain are present, make search for the pus with a needle. It is during this period, and this period only, that it is possible to strike the abscess, for it is then that the pus, not finding exit, is in sufficient quantity to be found at all. During the intervals the abscess walls are collapsed and lie in contact, for the pus has free exit, and there is no collection. During the relapse there is, as it were, a cup of pus, whilst during the interval the cavity is saucer-like only in its thickness, and very difficult to hit by a needle.

(2) When the pus traverses the chest alongside of the pericardium and between the layers of the broad ligament of the lung a difficult problem is presented to the surgeon.

The writer has had occasion to operate upon two cases of liver abscess in which the tract of pus was known to lie between the lung and the pericardium. The history of the case, the character of the pus expectorated, the percussion dulness, and the X-ray screen views combined to form fairly conclusive evidence where the pus lay. How to reach the tract of the pus in a region of such intricate difficulty is, and must remain, a serious problem.

In one of the cases a surgeon had attempted to reach the pus from the abdomen, hoping to strike the abscess at the bottom of the tract where the liver was adherent to the diaphragm; in this he failed. In another case the surgeon cut down on the cartilages of the fourth, fifth, and sixth ribs on right side, and after removing the greater part of them and ligaturing the internal mammary artery, attempted to reach the area of the pus. The adhesions between the pericardium on the one hand, and the lung on the other, were, however, so pronounced and so impossible to separate that the operation had to be abandoned. The writer dealt with these cases as follows:—

Finding it impossible to reach the pus from the side of the chest by the longest needle obtainable, 4½ in., and not considering it safe to introduce a needle of greater length in case it should break, he cut away 2 in. of the sixth and seventh ribs in the axillary line. At the bottom of the wound thus made a 4½ in. needle was pushed onwards through the lung until a hardened mass of tissue indicated that the fibrous wall of the tract of pus was reached close to the pericardium. So close was the needle judged to be to the pericardium that it required some courage to push the needle through the mass in the hope of hitting the pus track. This, however, was done, pus was found, and along the path of the needle a large trocar and cannula (Cantlie's) was inserted, the stretched drainage tube was introduced through the cannula, the cannula withdrawn, and syphonage drainage established. The result in both cases was complete success, both patients recovering. The depth of the track from the surface was 6½ to 7 in., the lung was traversed by the needle, the trocar and cannula, and subsequently by the drainage tube, yet no damage resulted to the lung. It is an operation that cannot be lightly undertaken, but the writer has found in this, as in other cases requiring penetration of the lung by trocar and cannula and drainage, as in the case of deep-seated hydatid of the lung with sound lung tissue between the surface and the hydatid, that no untoward results occur by thus dealing with the lung.

A CASE OF EQUINE TRYPANOSOMIASIS CHARACTERIZED BY THE OCCURRENCE OF POSTERIOR NUCLEAR FORMS.

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AND
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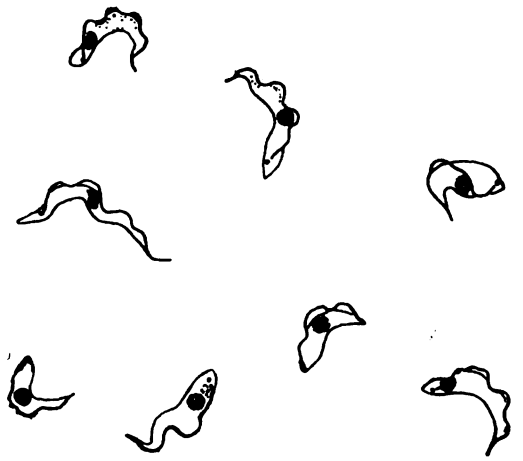
Since Stephens and Fantham [1] first described posterior nuclear forms in a trypanosome obtained from a human source the same morphological peculiarity has been recorded by several observers in other strains. Wenyon [2], for example, has described them in *Trypanosoma pecaudi* from the Bahr-el-Ghazal, Yorke and Blacklock [3] in *T. equiperdum*, and Blacklock [4] in a strain of *T. brucei* from Uganda. In July, 1912, one of us (J. W. S. M.) [5] observed these forms in a horse



T. brucei (*pecaudi*) from a horse Accra, Gold Coast. × 1,000

infected with *T. brucei* in Northern Nigeria; but with this exception, so far as we are aware, the occurrence of trypanosomes showing this morphological peculiarity has not been described from West Africa. We think, therefore, that the observations recorded in this note may be of interest.

Last July a series of blood slides was sent to the Medical Research Institute, Lagos, by Dr. Hutton, from Accra, on the Gold Coast. The blood films had been taken from two horses infected with trypanosomiasis. On examining them we found that the parasites were of the *T. brucei* (*pecaudi*) type, a species of trypanosome that is common throughout West Africa, and which accounts annually for a heavy mortality amongst domestic animals. The one horse had few trypanosomes in the blood, but in the other they were numerous, and on going over the slides it was observed that many of them had the nucleus situated in the posterior half of the body.

The accompanying drawings have been made from a film from the latter horse. They were made with a camera lucida, and the magnification was in each case 1,000 diameters. The usual long and slender forms and short and stumpy forms are illustrated, and in addition sketches are given of several forms in which the nucleus occupied a more or less posterior position. No forms were met with in which the trophonucleus was actually posterior to the kinetonucleus, although it was not infrequently seen almost touching it.

As there appeared to be an unusually large number of forms with the nucleus posterior, a thousand trypanosomes were examined with a view to determining the percentage. In doing this the procedure of Blacklock [6] was carried out. "Every trypanosome met with was counted, whether long, intermediate, or short, dividing or non-dividing. The number of posterior nuclears was noted, non-dividing forms only being chosen." The posterior nuclear forms were also classified, according to his convention, into his forms A, B, and C. The results were as follows:—

Trypanosomes enumerated	Posterior nuclear forms		
	A	B	C
1,000	80	17	1

There were thus 4·8 per cent. of the trypansomes in which the nucleus was definitely posterior. We do not know on what day of the infection the blood films we examined were taken, but such a percentage is certainly a high one. Stephens and Fantham (*loc. cit.*) found that in rats infected with *T. rhodesiense* these forms might form about 6 per cent., and Wenyon and Hanschell [7] as much as 72 per cent. of the parasites present.

The occurrence of posterior nuclear forms in the various species of trypanosomes mentioned above has been used as an argument against the specificity of *T. rhodesiense* [8], and it has recently been asserted that *T. rhodesiense* is *T. brucei* [9].

As it was not possible to examine the animal reactions of the trypanosome described above we cannot positively identify the species, but it presented the same morphological appearances as the parasite that accounts for a large number of deaths amongst horses every year in Northern Nigeria, several examples of which were identified for one of us by Sir David Bruce as *T. brucei* [10]. As the trypanosome is undoubtedly polymorphic, the species is probably that for which Stephens and Blacklock have proposed the name *T. ugandæ* [11]. This species and *T. pecaudi* are by some authorities considered to be the same.

In Nigeria, and we believe in other West African Colonies, *T. brucei* (*pecaudi*) is a common parasite of domestic animals. If, on account of the fact that posterior nuclear forms are common to both, we are to believe this parasite identical with *T. rhodesiense*, it is a curious fact that human trypanosomiasis in West Africa appears to differ materially

from the disease in Rhodesia. If *T. rhodesiense* is *T. brucei (pecaudi)*, we would expect to find cases of human trypanosomiasis due to *T. rhodesiense* in the places where *T. brucei* was common in the domestic animals. This is not the case. In Nigeria, at any rate, sleeping sickness does not present the acute features it does in Rhodesia. The disease is endemic, but by no means invariably fatal. The trypanosome from a case of sleeping sickness in Southern Nigeria has recently been studied by one of us. The results have not yet been published, but it may be of interest to state here that neither in its morphology, its measurements, nor its animal reactions does it resemble either *T. brucei (pecaudi)* or *T. rhodesiense*.

REFERENCES.

[1] *Proc. Roy. Soc.*, 1910, Series B, lxxxiii, No. B 561, pp. 28-33.
[2] JOURNAL OF TROPICAL MEDICINE AND HYGIENE, 1912, July 1, xv, No. 13, p. 193.
[3] *Brit. Med. Journ.*, 1912, August 31, p. 473.
[4] *Brit. Med. Journ.*, 1912, October 19, p. 1057.
[5] *Annals of Trop. Med. and Parasit.*, 1913, vol. vii, No. 1, pp. 3 and 16.
[6] *Annals of Trop. Med. and Parasit.*, 1913, vii, No. 2, p. 105.
[7] *Journ. Lond. School of Trop. Med.*, 1912, vol. ii, pt. 1, p. 34.
[8] BEVAN (LL.): Report on *Trypanosoma rhodesiense*, dated March 20, 1913; and WENYON (C. M.) and HANSCHELL (H. M.): "A Further Note on *Trypanosoma rhodesiense* from Three Cases of Human Trypanosomiasis," *Journ. Lond. School of Trop. Med.*, 1913, vol. ii, pt. 2, pp. 123-128.
[9] BRUCE (DAVID), HARVEY (DAVID), HAMERTON (A. E.), DAVEY (J. B.), and Lady BRUCE: "The Trypanosomes found in the Blood of Wild Animals Living in the Sleeping Sickness Area, Nyasaland," *Proc. Roy. Soc.*, 1913, Series B, vol. lxxxvi, No. B 587, pp. 269-277.
[10] *Sleeping Sickness Bureau Bulletin*, vol. iii, No. 31, p. 422, 1911.
[11] *Proc. Roy. Soc.*, B, vol. lxxxvi, pp. 187-191.

NOTES ON A CASE OF DERMAL LEISHMANIASIS IN BRITISH GUINEA.

By E. P. MINETT, M.D., D.P.H., D.T.M. & H.
Assistant Government M.O.H. and Bacteriologist.
With Clinical Notes on Treatment by
F. E. FIELD, M.D., D.P.H.
Government Medical Officer, Public Hospital, Georgetown.

THE patient, C. C., aged 47, was admitted to the Public Hospital in November, 1912, as a suspected leper. He is a well-developed healthy man of the negro race, a native of Barbados, and states that he has never previously suffered from any illness whatever. For the last fifteen years the man has been engaged in bush work of various kinds, principally wood-cutting and gold-digging.

There is a history of a chancre on the penis about six months previous to the onset of the present disease; this chancre appears to have been a "soft" one, which promptly disappeared with treatment.

The present condition started when the patient was up in the Wenamu gold diggings; the man first noticed a small "pimple" on the left forearm, there was no pain but intense irritation, causing him to scratch the pimple very frequently, resulting in free bleeding. The eruption gradually spread up and down the left arm, then it appeared on the left foot and spread up the legs as far as the groin; the right side was next gradually involved, beginning on the arm and extending to the legs as on the right side. The face was the last place to be involved; lesions did not appear on this situation until the eruption was well developed in the limbs.

The patient states that these "pimples" did not break into open sores until scratched.

The condition has remained practically stationary, or at most progressed but slowly for the last two years, in spite of vigorous treatment with a large number of drugs.

At present the condition is confined to the arms, legs and face, with two papules on the glans penis. The fresh nodules are raised, smooth, tense, and of a lighter colour than the surrounding skin; in places these nodules have coalesced so as to form raised pale-coloured plaques with a shiny tense-looking surface. When further advanced (and as the result of scratching) they lose their epithelium, become confluent, and assume first a more or less granulomatous condition; the final result is a mass of dried scabs or crusts formed by the drying of the yellowish exudation. The man states that he suffers a dull continuous pain from the nodules that are unbroken, together with intense irritation, but when the nodules are broken the pain becomes intense. There are no lesions to be detected on either the nasal or oral cavities, nor are there any ocular troubles of any kind. No anæsthesia is present either on the extremities, nasal cavities, or the nodules themselves; in fact, the man is distinctly hypersensitive all over.

This man was first suspected to be a case of yaws, and examinations were made of the nodules with a view to the detection of a spirochæte without success. The case was then examined for the presence of *Bacilli lepræ*, but without success on several occasions, and it was during the course of this examination that the Leishman-Donovan bodies were first detected.

A further investigation was then made, and mucus obtained from the juice and blood expressed from the nodules showed the presence of a large number of typical Leishman-Donovan bodies, both contained within the endothelial cells and lying free in the plasma of the fluid. A section taken through an excised nodule shows the epithelium to be proliferating at the edge, but practically absent over the surface of the nodule; the true dermis shows a large amount of small round-celled infiltration, together with a few polymorphonuclear cells in patches, giant cells are present at the periphery of the lesion. The bulk of the nodule itself consists of fibre plastic tissue, packed with small round cells and a few lymphocytes; polymorphonuclear cells are present at the edges of the lesion. A blood count gave the following results: Red corpuscles, 4,200,000; white corpuscles, 12,380; the hæmoglobin index working out at 70 per cent.

The differential count was as follows: Polymorpho-

nuclear cells, 53 per cent.; lymphocytes, 22 per cent.; large mononuclear cells, 19 per cent.; with eosinophiles, 6 per cent.

The man states that he was severely bitten by ticks whilst in the bush, and attributes the infection to this agency. He also states that several other men were similarly infected but recovered.

The Leishman-Donovan bodies have been incubated for some time at 37° C. in citrated blood, and in blood agar at the laboratory, but so far attempts to cultivate the flagellate form have been unsuccessful.

All attempts at treatment have been so far useless. A long course of treatment with mercury, both internally and externally, was tried, followed by a lengthy course of potassium iodide in large doses. The patient was then treated with nastin, and finally with salvarsan and neo-salvarsan. At the present time four doses of salvarsan, 6 grm., have been given intravenously during a period extending over three months. External applications, such as ung. salicylic, ung. picis, ung. hydrarg., have failed to make any appreciable difference. The medical officer in charge of the case has recently reported as follows: "The ulcers and nodules occupy the identical sites as on admission, and if improvement there is, it is not apparent."

The case appears to be undoubtedly one of dermal Leishmaniasis, commonly called "boch yaws" in Surinam and bush yaws or forest yaws locally, but as far as can be ascertained the Leishman-Donovan bodies have not previously been detected, as present in cases occurring in this colony.

Notice.

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

A MEETING of the Society will be held at 11, Chandos Street, Cavendish Square, London, W., on Friday, November 21, 1913, at 8.30 p.m.

AGENDA.

(1) A paper (with epidiascope demonstration) on "The Prevention of Malaria in Rural Districts" will be read by Malcolm Watson, M.D., D.P.H. (Cambridge).

(2) A demonstration upon "Lupoid Leprosy and the Results of Treatment of Leprosy by means of a Cultural Extract" will be given by H. Bayon, M.D.

"Journal of the Royal Army Medical Corps," vol. xxi, No. 4, October, 1913.

Prognosis of Bilharziasis.—Harrison writing on this subject concludes that it is obvious that bilharziasis is a much more prolonged disease than we have been accustomed to think. The earliest period at which we may hope for recovery is from five to seven years after the onset of symptoms, and this in only one-tenth of the cases, whilst it may last without relief for at least thirteen years. The direct and indirect mortality from bilharziasis among Europeans removed from the endemic area is probably not more than about 1 per cent., and there is no reason to suppose that bilharzial infection increases the tendency to phthisis.

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THE JOURNAL OF

Tropical Medicine and Hygiene

NOVEMBER 15, 1913.

LONDON SCHOOL OF TROPICAL MEDICINE.

ANNUAL DINNER.

PRESENTATION OF PORTRAIT TO SIR PATRICK MANSON, G.C.M.G.

THE annual dinner of the London School of Tropical Medicine was held on October 24, 1913, at the Prince's Restaurant, Piccadilly. Dr. F. M. Sandwith presided, and amongst those present were: I. Ablett, Esq.; Colonel A. Alcock, C.I.E., I.M.S., F.R.S.; Sir John Anderson, G.C.M.G., K.C.B.; Algernon Aspinall, Esq.; Dr. M. Atkinson; E. E. Austen, Esq.; Dr. C. R. Avari; Dr. A. G. Bagshawe; Dr. P. Bahr; Major C. R. Bakhle, I.M.S.; Dr. A. Balfour; Fleet-Surgeon P. W. Bassett-Smith, C.B., R.N.; Dr. H. Bayon; Sir Wm. Bennett, K.C.V.O.; Sir E. W. Birch, K.C.M.G.; Dr. H. L. Booth; Sir J. Rose Bradford, K.C.M.G.; Surgeon-General Sir A. M. Branfoot, K.C.I.E.; Dr. H. Lynch Burgess; A. B. Bruce, Esq.; Sir R. Burnet, J.P.; J. Cantlie, Esq., F.R.C.S.; Dr. H. Cato; Rt. Hon. Austen Chamberlain, M.P.; Dr. A. Chaplin; Sir Havelock Charles, G.C.V.O.; Rhys Charles, Esq.; Captain A. W. Clarke; Dr. R. P. Cockin; Dr. A. Copland; G. Croll, Esq.; Major H. M. Cruddas, I.M.S.; Rev. I.

Cumming; Dr. C. W. Daniels; Dr. C. N. Davis; Colonel J. R. Dodd, R.A.M.C.; Dr. H. L. Duke; Dr. J. Dunlop; Dr. S. C. G. Fox; Dr. E. M. Franklin; Dr. J. C. Franklin; Dr. E. J. Garstin; Fleet-Surgeon A. Gaskell, R.N.; A. P. Hughes Gibb, Esq.; Dr. F. Grenior; Dr. E. H. Griffin; Dr. J. G. Hare; A. L. Hetherington, Esq.; Professor R. T. Hewlett, F.R.C.S.; Commander G. Hodgkinson, R.N.; Dr. J. K. A. Hofmeyr; Dr. G. Horner; Dr. J. M. Joly; J. S. Joly, Esq.; C. B. Kingston, Esq.; A. Lampard, Esq.; Dr. Hugh Lawson; Dr. R. T. Leiper; Colonel Sir Wm. Leishman, R.A.M.C.; Sir F. Lovell, C.M.G., LL.D.; Dr. G. C. Low; Sir Chas. Pardey Lukis, K.C.S.I.; Dr. C. B. Mack; A. G. R. Mackenzie, Esq.; Dr. J. M. H. Macleod; Sir Patrick Manson, G.C.M.G.; Surgeon-General A. W. May, C.B., R.N.; Dr. E. Marshall; Dr. Martley; Dr. H. J. McCaw; Dr. Campbell McClure; C. C. McLeod, Esq.; Dr. E. M. Merrins; P. J. Michelli, Esq., C.M.G.; Rt. Hon. Viscount Milner, G.C.B., G.C.M.G.; Dr. R. M. Mitchell; Major St. John Moses, I.M.S.; Dr. C. E. F. Mouat-Biggs; Colonel T. R. Mulroney, I.M.S.; Percival A. Nairne, Esq.; Spencer Nairne, Esq.; Alex. Neilson, Esq.; Dr. H. B. Newham; Dr. W. P. Norris; Dr. F. W. O'Connor; Captain D. J. F. O'Donoghue, R.A.M.C.; C. T. Orford, Esq.; A. C. C. Parkinson, Esq.; Dr. A. R. Paterson; Dr. R. G. Perkins; J. M. Pirie, Esq.; Dr. W. T. Prout, C.M.G.; Dr. Z. Rajehman; H. J. Read, Esq., C.M.G.; Rt. Hon. Sir J. West Ridgeway, G.C.B., G.C.M.G., K.C.S.I.; Dr. J. R. Ridlon; E. H. Ross, Esq.; J. D. Ryder, Esq.; Surgeon G. B. Scott, R.N.; Dr. L. Sells; Dr. R. O. Sibley; Dr. J. S. Smith; H. Hamel Smith, Esq.; Dr. D. Sommerville; Dr. A. Campbell Stevenson; General The Hon. Sir Reginald Talbot, K.C.B.; Dr. F. E. Taylor; Sir Wm. Taylor, K.C.M.G.; Sir Wm. Treacher, K.C.M.G.; Dr. J. A. Valentine; Dr. H. C. Waldo; Captain G. H. Walker, D.S.O.; Dr. H. G. Waters; Dr. B. H. Wedd; Dr. C. M. Wenyon; F. Wilde, Esq.; Colonel E. Wilkinson, I.M.S.; Dr. H. Williams; Dr. A. C. Wilson.

After the loyal toasts had been proposed by the Chairman and duly honoured, Mr. A. Chamberlain, in proposing the toast of "The London School of Tropical Medicine," said that he supposed it was entrusted to him because it had recently been his good fortune to be connected from the outside rather intimately with the fortunes of the School. He was glad of the opportunity which was afforded him of saying what had been done with the funds which had been collected. He accepted the invitation of Mr. Lewis Harcourt to take the Chairmanship of the Committee to raise funds for the School for several reasons. The first reason, he need have no hesitation in saying, was a filial one, and it was on the ground of his father's connection with the School that Mr. Harcourt appealed to him. That was not the only reason. The study of tropical medicine had in the past twenty or twenty-five years made giant advances, and in the progress which it had made Englishmen had borne a distinguished and a leading part. As the possessors of the greatest tropical and sub-tropical Empire existing in the world Englishmen had a special obligation alike to the subject races, of whose well-being they were the guardians, and to the young men of their own race who went out to other climes, carrying with them the honour of England, doing her work, spreading her civilization, and increasing her reputation. England owed to them that at least she should do everything she could to minimize the risks they naturally had to run, and should show her appreciation of their work by striving to secure thorough research into the conditions of health and the cause of illness, to which their labours rendered them particularly exposed. It was a matter of national honour and national pride that in a movement so beneficial Englishmen should be encouraged to carry on the work and that England should stand in the forefront of the pioneers and of the new learning which was being acquired. They set out to obtain a sum of £100,000, and they had received the not inconsiderable sum of over £70,000.

Allocation of the Fund.

Acting on the advice of the Committee of Management of the School of Tropical Medicine and of the Head of the Seamen's Hospital, they desired, in the first place, to make a not very large, but an absolutely necessary extension of the buildings of the School. To that they had devoted £15,000; not an undue proportion of the fund to sink in bricks and mortar. The second object was to provide a fund for research. That they had been able to carry out by the kindness of Sir William Bennett in allocating to this purpose the legacy of £10,000 which the late Lord Wandsworth entrusted to his discretion. This object had been further served by strengthening the staff of the School. The third object of the Committee and the subscribers was to obtain a moderate endowment for the School, which should place it beyond immediate want and prevent it being always hampered by lack of funds. For that purpose there had been already allocated a sum which would produce an annual income to the School of about £1,400, and additional funds had been obtained which would allow of another £400 a year. The last of the objects was one of some delicacy. Men sometimes returned from the Tropics suffering from tropical diseases, but with means insufficient to secure the attention of those with special knowledge of tropical medicine, which was confined to very few. They were anxious, therefore, to make some provision for cases of that kind, and owing to the help received from the authorities at the Seamen's Hospital they had been able to make arrangements for people of that class. A large measure of success which had attended the appeal would never have been obtained but for the hearty co-operation of numberless people. He had been moved by the response which had been made to the appeal from all quarters, and he was particularly touched by letters he had received from many tropical dependencies of the Crown, in which the writers sent their humble contributions. He wished

to take that opportunity of asking the gratitude of the company and of recording his own in particular to the City Committee. Thanks to the London Chamber of Commerce, in the first instance, and to the City Committees formed under their auspices, in the second, the response from companies had exceeded his most sanguine expectations. It was unnecessary at that gathering for him to dwell upon the appreciation which was felt for the work of the School by those who most immediately benefited by it, and who were best able to judge of the results achieved. But he might give an instance showing how cordial was the response which was being made to the invitation issued to some of those tropical colonies by the Colonial Secretary for a contribution to their funds. When it was gently suggested by the Colonial Office to the Government of the Federated Malay States that in view of the importance of the School to them they might be willing to vote £500 of public money to the fund, a telegram was received in reply stating that in view of the importance of the work to them the unofficial members of the Council suggested that a grant of £5,000 should be made. Those who subscribed in this country need not, therefore, think that they subscribed to a work for an ungrateful few who could not appreciate what the School was doing. Great as had been the advance which tropical medicine had made in the last few years, he believed they had only scratched the soil so far, and that was a most hopeful and encouraging sign. The discoveries made were not final or conclusive; each opened up a new vista, and new possibilities, and they were changing the whole of our mental attitude towards the problems of tropical disease, health, settlement, and development. Diseases which were once thought to be the inevitable concomitant of that development were now seen to be preventable.

The CHAIRMAN, in reply, referred to the great efforts of Mr. A. Chamberlain on behalf of the fund, and said that it was intended that one of the wards in the hospital should bear the name of the "Chamberlain Ward." He was glad to be able to report that the School was in a fairly flourishing condition. They had the largest class of students they had ever had, and the greatest number of resident students.

PRESENTATION OF PORTRAIT TO SIR PATRICK MANSON.

Mr. JAMES CANTLIE said that it was his privilege, along with Dr. Prout, C.M.G., as representing the London and Liverpool Schools of Tropical Medicine respectively, and in the names of many subscribers to a national presentation to Sir Patrick Manson to bring his picture before them. They had been fortunate in obtaining the permission of the Chairman on this occasion—Dr. F. M. Sandwith—to make the presentation, and they had been enabled by the co-operation of Mr. P. Michelli, C.M.G., to do so. The presentation was in the form of a portrait of Sir Patrick by Mr. Young Hunter, and many present would remember seeing the painting in the Royal Academy. They were also especially fortunate inasmuch as they had obtained the consent of the Rt. Hon. Austen Chamberlain, M.P., to unveil the portrait. They would all remember that on the occasion of the International Medical Congress in August, 1913, an international testimonial in the form of a medallion was presented as a world's tribute to Sir Patrick Manson by Professor Blanchard, of Paris. Those who took part in that ceremony were not likely to forget the eloquence of that address and the moving and glowing tribute paid to Sir Patrick by Professor Blanchard on that occasion. It was felt, however, that whilst they contributed to and took part in the international testimonial it would be becoming were Sir Patrick's countrymen to show their esteem for him and the appreciation of the work he had done for the British Empire; and it was accordingly resolved that his portrait should be presented him. It was this portrait that was now brought before them, and Sir Patrick's acceptance of this tribute of their regard for him personally and of their gratitude for the benefits they had received at his hands was asked. Sir Patrick Manson, after completion of his medical studies in Aberdeen, went to the Island of Formosa in the China Seas to take up an appointment as medical officer in the service of the Imperial Maritime Customs of China. In that isolated spot he worked out the part played by mosquitoes in the spread of filariasis. The great truth of his discovery and the principles it involved were beyond the power of man's intellect to grasp at the time, and Manson had to wait many years before men's minds fully recognized that an entirely new range of thought was unfolded. Although, however, this magnificent piece of scientific work was neglected for a time, it came to light again in a much wider field of disease, namely, malaria, and all present were well acquainted with the mosquito-malaria theory which was evolved as the result of Manson's work in Formosa. The effects of this Formosan discovery will endure until the end of time. It is one of those strokes of genius which give a fresh direction to scientific thought and is to be classed with Jenner's introduction of vaccination, Pasteur's epoch-making researches, and Lister's introduction of modern surgical methods. Laveran's striking discovery of the malaria parasite might have remained of but academic interest had not Manson's mosquito-malaria theory been framed. The consequences already resulting were gigantic, for there is not a branch of modern medical research that is not beholden to the principles it enunciated, nor yet a corner of the earth where benefits to mankind are not in evidence. Sir Patrick Manson had retired from active work amongst them, but he had left behind him a name that would never perish, a reputation which was unique in medical history, and an example which would continue to stimulate and influence scientific thought for ever.

Dr. PROUT, C.M.G., in an eloquent speech, spoke to Sir Patrick Manson's attainments which have had so marked an influence upon the direction of scientific thought. The practical outcome is shown

in many directions and in none more so than in the case of the Panama Canal. Disease formerly prevented its completion, and it was only when the principles initiated by Sir Patrick Manson were applied and disease overcome that this great scheme was rendered feasible.

Mr. A. CHAMBERLAIN, in unveiling the portrait, said that it was owing to the inspiration of Sir Patrick Manson that the London and Liverpool Schools of Tropical Medicine sprang into existence almost at the same moment. Sir Patrick's friends asked him to accept the portrait as a testimony to their gratitude to him for his help and of their affection for him. They wished to recognize the honour he had done his country and the great services he had rendered to mankind.

Sir PATRICK MANSON having suitably acknowledged the gifts, the CHAIRMAN proposed the health of the guests, to which Sir JOHN ANDERSON replied. Viscount MILNER, in submitting the toast of "The Chairman," paid an eloquent tribute to the value of Dr. Sandwith's work in Egypt.

During the evening a message of greeting was sent to Mr. JOSEPH CHAMBERLAIN, who replied: "Thanks for your message. I wish you a pleasant dinner, and I congratulate you on progress made."

Abstract.

SHANGHAI MUNICIPAL COUNCIL HEALTH DEPARTMENT ANNUAL REPORT, 1912.*

By ARTHUR STANLEY, M.D., B.S.Lond., D.P.H.
Health Officer.

THE author states that the past year was not a healthy one. There was a considerable increase in the incidence of acute diarrhœa, typhoid fever, and scarlet fever—all preventable diseases, while the augmented death-rate was, in the case of the foreign population, due, to some extent, to increased mortality among children from general causes, such as bronchitis, the incidence being mainly among Japanese. The increased Japanese population has introduced a new element into the composition of the foreign community, which now resembles that of a home industrial city. In the past the foreign community consisted largely of people in more or less affluent circumstances, but now the greater number correspond to the poorer class of a European city, the children of whom contribute extensively to the death-rate. For this reason, although there may be a gradual improvement in sanitary conditions, any notable lessening of the death-rate is improbable until the community has arrived at a fixed composition.

The Sub-District Health Offices, sixteen of which are now scattered through the Settlement, have proved of the greatest value in practical sanitation. Each section of about 30,000 of the population now has a Health Office in miniature in charge of a foreign assistant sanitary inspector, where vaccination is done at stated times and many other benefits of modern sanitation are available for the public, foreign and Chinese. The Chinese are beginning to voluntarily report cases of preventable disease and deaths, and, with the general employment of the medical practitioner educated on modern lines, these subsidiary Health Offices will make the application of such modern sanitary measures, as it has not yet been possible to organize, a comparatively easy matter. When, for example, small-pox has been stamped out by bringing free vaccination almost to the doors of the people, it will be possible to attack the greatest of all modern health problems, the prevention of tuberculosis. In the near future the Chinese public will probably learn the necessity for calling in medical practitioners to recognize cases of infectious disease, such as scarlet fever and diphtheria, and may then better understand the need for isolation in order to prevent these diseases. Patience is, however, required. The full benefits of modern sanitation are applicable only to a community ready to receive them. They cannot be forced on a reluctant people. The Chinese must be gradually educated up to the standards of modern municipal life. The past fifteen years has seen in Shanghai a gradual building up from very small foundations of the fabric of modern sanitation, and the halfway house has now been reached.

The incidence of choleraic diarrhœa affected the community seriously; for not only were the number of cases, both among foreigners and Chinese, exceptionally high, but the port was declared infected with cholera by the Japanese authorities. In the absence of the cholera organism, the disease was not officially recognized as cholera, but, as the method of prevention of these maladies is the same, it matters little by what name it is called. It is felt that unless more stringent action is taken against the hawking of fruit, sliced melons and other foodstuffs which carry the infection, a large preventable loss of life will be liable to occur annually. Until the sale of fresh foodstuffs is confined to municipal markets and licensed shops, the summer incidence of severe diarrhœa, often fatal and clinically resembling cholera, is calculated to kill extensively. The deaths from this trouble occur chiefly among the very poor, who live from hand to mouth, deriving much of their sustenance from itinerant hawkers, whose fly-infected stock-in-trade is an obvious danger. The need for further action has been annually pointed out; but there has been an objection to interfering with the old customs of the wharf and other coolies, the main sufferers, who, during the hottest weather, are decimated as a result of eating fly-infected food bought from the basket men. These coolies are unable to take care of themselves in respect to their food, so that it would appear necessary for the Health Office to be empowered to safeguard them as far as possible. The placing of the port in quarantine is a serious disability to trade, and it appears necessary to face the question squarely and decide whether it is not advisable to deprive the wharf coolies of their

* Shanghai: Printed by Kelly and Walsh, Limited, Canton Road, 1913.

usual supplies so as to enable them to take their food under proper sanitary conditions. The presence of these food hawkers on the wharves, where they sell infected food to passengers, is also the main source of the cases of sickness among the steerage passengers which are the cause of quarantine restrictions being imposed.

The recommendations of the International Sanitary Conference at Paris in 1911 have recently been published. Forty-two countries were represented at the Conference, including China for the first time. The following recommendations have some bearing on the sanitation of Shanghai:—

The first case of cholera, plague, or yellow fever must be immediately notified.

As regards plague, proposals were made to impose a compulsory system of periodic rat destruction on all ships, and even to extend the same to ports. These proposals were mainly supported by countries having little or no mercantile marine, but they were not accepted by the Conference. It was, however, decided to insert in the new Convention a recommendation that ships should be subjected to periodic rat destruction at least every six months, and that preferential treatment should be accorded in ports of arrival to ships which had undergone the process. Rat destruction on suspected ships was made compulsory. The period of ten days' surveillance or observation, which was imposed at the Paris Convention of 1903 upon all persons landing from plague-infected ships, was reduced to five days. This reduction was consequent upon recognition of the fact that the incubation period of bubonic plague rarely exceeded five days, and that the incubation period of pneumonic plague was still shorter.

As regards cholera, in view of the heavy expense and vexatious delay upon shipping which a routine bacteriological examination of passengers and crews of vessels from cholera-infected ports would entail, the Conference decided that bacteriological examination may be applied only in the case of infected or suspected ships as far as is necessary, that is to say, amongst contacts or suspected persons. The Conference recommended that research work should be undertaken with a view to discovering how the cholera vibrio maintains its existence in countries where the disease is endemic, and from which the periodic outbreaks of pandemic cholera have their origin. Regarding yellow fever, which, when the Panama Canal is opened, will probably become a disease for China to guard against, the provisions of the Washington Convention of 1905 were considered of too stringent a character. The Conference fixed a period of six days' observation or surveillance to be obligatory in the case of infected ships and optional in the case of suspected ships. In both categories mosquitoes were to be exterminated on the ship, as far as possible, on arrival and before unloading. If this were not possible, precautions were to be taken with regard to persons employed in unloading. Both infected and suspected ships were to moor, when feasible, 200 metres from shore, in order to prevent the circulation of mosquitoes between ship and land. These regulations were made obligatory in countries only where the *Stegomyia calopus* exists, that is to say, in China.

Public Health Measures Needed.

The application of measures for excluding rats from dwellings throughout the Settlement.

Further amendment of the Chinese Building Rules so as to secure as far as possible rat-proof houses.

Amendment of the Foreign Building Rules so as to secure proper kitchen arrangements and, as far as possible, rat-proof houses.

Extension of the Health Office and Laboratory building.

Completion of the Isolation Hospital to include isolated accommodation for cases of tuberculosis among foreigners.

Further development of Health Offices in each sanitary sub-district, including an improved system of death registration.

Dispensaries for Chinese consumptives (in connection with the District Health Offices), a hospital for advanced cases and a sanatorium for curable cases of consumption.

A new Land Regulation dealing with Public Health measures generally.

More small public markets.

The following general Public Health Notices, for foreigners and Chinese respectively, have been published during the year.

Public Health Notice for Foreigners.

The following measures are recommended for the purpose of preventing those diseases which, by means of public sanitation and by individual careful living, are preventable, such as typhoid fever, cholera, dysentery, diarrhœa, and other bowel disorders, small-pox, scarlet fever, diphtheria, tuberculosis, plague, and malaria.

Public Measures.

Sanitary inspection of houses will be carried out free of charge on application to the Health Officer. Persons about to rent houses are advised to ask the Health Officer for a sanitary inspection and a certificate of good sanitation before closing with the landlord.

Conditions dangerous to health should be reported to the Health Officer.

Isolation of cases of dangerous infectious disease is provided at the Isolation Hospital, Range Road.

Disinfection of premises after infectious disease will be carried out free of charge on application to the Health Officer.

Individual Measures.

Eat and drink nothing that has not been recently cooked, boiled, or otherwise sterilized.

Do not consume:—

* Fruit, vegetables, salads, melons, &c., which have not been cooked or sterilized.

* Fruit, tomatoes, melons, &c., can be sterilized so that they can be safely eaten raw, and without spoiling the flavour, by

Food on which flies have settled.

* Milk or cream which has not been boiled or sterilized.

* Water which has not been boiled or filtered through a Berkefeld filter.

Aerated waters and other drinks unless of best quality.

Alcoholic drinks during the hot weather.

Ice-cream unless made of boiled materials.

Uncooked oysters.

Fish from June to October.

Kitchen supervision should be thorough because the preventable diseases specially prevalent in Shanghai are mostly caused by infected food. Every house should have a serving-room adjoining the dining-room and separate from the kitchen. The serving-room should contain the Berkefeld filter, ice-chest, table utensils, washing sink, boiled milk, drinks, bread, butter, fruit, and other cooked or prepared foods. Cooking or boiling destroys infection.

Vegetables and fruit grown near the ground, being watered as a rule with nightsoil, are specially liable to be soiled with the germs of typhoid fever, cholera, dysentery, and other bowel diseases, and should, before cooking, be strictly kept out of the serving-room and from contact with cooked or prepared food.

Flies carry disease, so they should be excluded from the serving-room, kitchen, and servants' latrine by providing spring doors and unopenable windows screened by perforated zinc, and from the food on the table by fly covers.

Vaccination should be done on arrival in Shanghai and afterwards every three years.

Keep rats out of your house. Starve the rats by providing no food for them in and around your house. Keep cats. Make your house rat-proof.

Mosquitoes carry malaria. Where mosquitoes cannot be exterminated by abolishing stagnant water or by the use of kerosene oil, or by reporting their presence to the Health Officer, the mosquito net should be carefully used. A weekly inspection should be made and no standing water permitted.

Refuse should not be allowed to accumulate, and a properly covered, easily lifted galvanized iron receptacle should be provided. Nightsoil buckets should be kept securely closed, including those in the servants' latrines. Proper receptacles for these purposes may be obtained at the Health Office. Yards and drains should be kept in a good state of repair and freely flushed with water.

Vital Statistics.

Population.

The foreign population of the Settlement north of the Yangkingpang, including the outside roads and Pootung, at the last census taken on October 15, 1910, was 13,536, and consisted of 6,293 men, 4,172 women, and 3,071 children. The foreign shipping population, which numbered 1,755, was not included. The foreign population for the middle of 1911 was calculated at 14,000. The census of the foreign population taken at each quinquennial period since 1870 shows the following expansion: 1,666, 1,673, 2,197, 3,673, 3,821, 4,684, 6,774, 11,497, 13,536.

The native population on October 15, 1910, was 488,005, and consisted of 227,175 men, 129,924 women, and 130,906 children. The Chinese population for the middle of 1911 was calculated at 500,000. The census of the Chinese population taken at each quinquennial period since 1870 shows roughly the following expansion: 75,000, 96,000, 108,000, 126,000, 168,000, 241,000, 345,000, 452,000, 488,000.

Deaths.

Deaths among the Resident Foreign Population.—During the year 1912 the total corrected number of deaths registered among foreigners, including non-Chinese Asiatics, was 343; of this number 294 occurred among the resident population.

Six months spent continuously in Shanghai is taken to constitute residence as in former reports. As the non-resident population is a variable and indeterminate factor, the deaths in this category are eliminated in the calculation of the death-rate. The death-rate per thousand per annum, therefore, calculated from 294 deaths occurring among the resident foreign population of 14,000, is 21, as against 16·8 in 1911. The deaths of 102 children (persons under 15) have been registered, as against 73 last year; of the deaths among adults, 120 were men and 72 women; of children, 51 were boys and 51 girls. The mean age at death among the adult resident population was 41·5.

Small-pox, the most obviously preventable of all diseases, levied a toll among the unvaccinated.

Scarlet fever, which killed so many in 1902, shows signs of increased prevalence.

Tuberculosis heads the list of fatal diseases both among foreigners and Chinese, and the prevention of this disease offers a fine field for future work.

Alcohol has been responsible for the deaths of ten foreign residents during the year.

Lobar pneumonia, which nine years ago assumed almost epidemic proportions, caused four deaths.

Beriberi is now a frequent cause of death among foreigners on account of the increased Japanese population.

Plague-infected rats were found in diminished numbers.

Among the non-resident population the chief causes of death were acute diarrhœa, drowning, tuberculosis, small-pox, typhoid fever and dysentery.

Deaths among the Native Population.—9,363 deaths among the Chinese have been reported, compared with 6,799, 8,156 and 8,329 in the three preceding years.

The death-rate per thousand per annum is 19·3. There were 124 deaths from small-pox, as against

dipping for a few seconds into briskly boiling water. Strawberries are better sterilized by dipping into boiling sugar syrup. Milk and cream can be sterilized by placing the bottles in a pan of cold water and gradually raising to boiling point. The candle of the Berkefeld filter should be lightly scrubbed in running water and then boiled once a week regularly.

156 last year. Both scarlet fever and diphtheria show increased prevalence. Of the deaths, 5,318 were male and 4,345 female. The deaths of 3,993 children (persons under 15) have been registered; of these, 2,107 were boys and 1,886 girls.

Infectious Disease.

Notification.

In the absence of legal obligation to notify, an arrangement has been made between the Municipal Council and the qualified medical practitioners of Shanghai requiring notification of infectious disease for the facilitation of preventive measures, in consideration of the use of the resources of the Public Health Laboratory for the purposes of pathological diagnosis and the payment of a fee of one tael for each case. The notifiable diseases are: Small-pox, cholera, typhoid fever, typhus fever, diphtheria, scarlet fever, tuberculosis, plague, anthrax, glanders, leprosy and hydrophobia. Tls. 367 were paid for notification fees, as against Tls. 385 and Tls. 110 in the two preceding years.

The system of notification, so far as it goes, has worked well, and the best thanks of the community are due to medical practitioners for their co-operation. Chinese cases are beginning to be usefully notified by Chinese practitioners educated according to the foreign standard.

During the year 113 Bills of Health for ships and cargoes were issued, as against 147 in the previous year.

Weekly returns of infectious disease have been exchanged so as to get in touch with the sanitary condition of places in the Far East in communication with Shanghai.

Isolation.

Isolation for cases of infectious disease among foreigners and Chinese is provided in the Isolation Hospital, Range Road, an account of the work of which institution will be found under Hospitals.

Disinfection.

7,122 rooms were disinfected, as against 1,936 and 2,162 in the two preceding years; 103,550 articles have been disinfected by steam, compared with 80,575 and 107,288 in the two preceding years. 29,704 articles were disinfected by formalin, compared with 24,856 last year. The Disinfection Station adjoins the Isolation Hospital. Prior to disinfection each disinfector dons a sterile overall. The general method of disinfecting in a house after a case of infectious disease is firstly to remove to the Station everything that can be disinfected by steam; then to spray and wash walls, floors, fittings and furniture with disinfecting solution (cyllin). Fragile and delicate ware, such as bonnets, books and photographs, are disinfected by formalin. In many cases, such as after typhoid fever or diphtheria, disinfection of walls, &c., is not considered always necessary, the washing with disinfectant being then limited to articles that have been actually in contact with infected material. After disinfection, painting or colour-washing of walls and ceiling is advised to be done by the occupier before the room is again occupied, without which no responsibility can be accepted by the Health Office.

Small-pox.

The incidence of small-pox was considerable. Twenty cases were notified among the resident foreign community, of which three were fatal. Among the Chinese there were 124 deaths from small-pox, as compared with 156, 304, 19, 143 and 863 during the preceding five years.

Small-pox is the typical preventable disease, and its presence or absence is an index of the hygienic education of a community. In Shanghai the Chinese are beginning to appreciate the benefits of vaccination as opposed to inoculation, which they have practised with little benefit for hundreds of years, and which is now illegal in almost all civilized countries.

Vaccination is done free for all Chinese and indigent foreigners applying at the Sub-district Health Offices. Vaccine is also supplied free to the Chinese hospitals in Shanghai. 6,108 vaccinations have been done by the Health Office during the year, as compared with 465, 380, 520, 1,418, 4,649, 3,244, 4,608 and 4,933 in previous years.

There is no doubt that vaccination repeated until it no longer takes always prevents small-pox. The criterion of efficient vaccination is inability to be vaccinated. In Shanghai there exists so much small-pox infection that vaccination should be repeated every three years until it no longer takes. Where previous good vaccination is not shown by white net-like scars, aggregating at least one square inch in area, particular care should be taken to get efficiently vaccinated.

Cholera.

Acute diarrhœa of choleraic type was prevalent from July to September, affecting severely both foreigners and Chinese. In none of the numerous cases examined, with the exception of a case introduced from Sungkiang, was the characteristic cholera organism found after repeated and extended examination in the Laboratory. Not only were vibrios of any kind remarkable for their absence from the stools of these cases, but such as were discovered showed no agglutination with a specific cholera serum. Though the disease was not recognized as Asiatic cholera in the absence of the cholera organism, cases were notified as cholera by practitioners and cases brought to Japanese ports on ships from Shanghai were declared to be cholera and quarantine restrictions imposed.

Attention was directed to the need of personal care in preventing the group of bowel diseases characteristic of life in Shanghai, which includes cholera and allied conditions, typhoid fever and dysentery and allied conditions. The same methods of prevention apply to all, namely, to eat and drink nothing that has not been recently boiled or cooked or otherwise sterilized.

Living in an alien country, the only sure way of securing purity of food is by sterilization. Steriliza-

tion means freeing from micro-organisms, especially the bacteria of disease. Sterilization may be accomplished best of all by heating to boiling-point, as by cooking and boiling. The Berkefeld filter sterilizes water, provided the filter candle be boiled once a week at least. Canned goods, including butter, are necessarily sterilized during the process of canning, otherwise they would not keep. Bottled beverages of good reputation are practically devoid of dangerous bacteria. Ice is not sterile and should not be put into drinks. Fresh fruit, tomatoes, melons, &c., may be effectively sterilized, without spoiling the flavour, by immersion for a few seconds in boiling water, any infection that may be present being invariably on the surface, provided the fruit be sound.

If the simple rule be observed of eating and drinking nothing that has not been recently cooked or boiled, or otherwise sterilized, it is practically impossible to contract any of those bowel troubles to which the Shanghai resident is especially prone. When this fundamental fact is grasped, "chills," "livers" and "cholera belts" will cease to be considered matters of importance.

Typhoid Fever.

The incidence of typhoid fever remains an important sanitary factor. The fatality of the disease, now that para-typhoid fever and undulant fever are less frequently included, approaches the true type. In nearly all cases where the origin was investigated obvious breaches of the ordinary rules of health, as laid down in the Public Health Notice, were observed.

The infection of typhoid fever may be conveyed by vegetables and oysters which have been contaminated with infected ordure, by water, by milk contaminated with infected water, through the air by means of infected dust, and directly from persons suffering from the disease or who act as "typhoid carriers" subsequent to recovery. Typhoid fever is a preventable disease, its prevention being largely a matter of individual care in the observance of the rules set forth in the Public Health Notice which has been issued to all applicants at the Health Office.

The cause of typhoid fever is practically always taken into the body with infected food, and the foods most commonly infected are vegetables, by reason of the manner in which they are grown. Especial stress should be laid on the fact that vegetables are frequently the source of infection with typhoid fever, cholera, dysentery and other forms of diarrhœa, and particular care should be given to their thorough cooking and separation before cooking from the rest of the food. The larder or room for storing uncooked food should be separated from the pantry or serving-room where table utensils, ice-chest, bread, milk, Berkefeld filter, and cooked food are kept. There should be a washing-up sink in the serving-room so that table utensils need not be taken into the kitchen to be washed. A place in the yard outside the kitchen for the washing and preparation of vegetables prior to cooking is an additional precaution that may be recommended.

Measles.

There was an outbreak of measles, remarkable for its infectivity and severity, from November, 1911, till April, 1912. There were three fatal cases among foreigners and 373 among Chinese. As bearing on this subject it may be noted that a similar epidemic visited the Philippine Islands about four months earlier. The severity of the disease was much greater than usually encountered and was attributed to the introduction of a new strain of virus by transports from the United States; it was, in fact, decided to make it quarantinable.

Diphtheria.

The incidence of this disease has not been marked, and the case fatality has been small. Diphtheria antitoxin is supplied free to indigent patients in Shanghai on the recommendation of the physician. In any case of suspected diphtheria, antitoxin should be given at once, without waiting for the result of the bacterial diagnosis.

Scarlet Fever.

The annual admission of foreign cases into the Isolation Hospital since 1902 has been 34, 7, 11, 11, 20, 70, 25, 9, 32, 22, and 64. Of these 305 cases 54 proved fatal, a case fatality of 16·7 per cent., as compared with a case fatality in England of under 5. The case fatality has not markedly changed since the introduction of scarlet fever into Shanghai.

Although scarlet fever has hitherto failed to establish itself firmly in any part of Asia, excepting Asia Minor, and is practically unknown in the Tropics, it appears to have come to Shanghai to stay. Scarlet fever was practically unknown in Shanghai prior to 1900, when it was probably introduced by foreign immigrants. As would be expected with a recently introduced disease, against which evolution has afforded no natural immunity, scarlet fever has been of a virulent type among the Chinese. It is probable that the passage of the disease through the susceptible Chinese has led to an intensification of the virus, so that it is more fatal to foreigners also.

Early notification, isolation and disinfection are especially necessary in dealing with such a fatal and infectious disease as scarlet fever is in Shanghai. The commonest mode of infection is from a previous case either by contact, by proximity, or by means of infected articles. The infection is given off by the breath in coughing and speaking, by the secretions of the mouth, nose, ear and throat, and later by the peeling skin.

The incidence during the year was sporadic and indicates need for early isolation and disinfection to prevent an epidemic recurring among the vast mass of susceptible material which exists in the Settlement.

Tuberculosis.

The prevalence of tuberculosis remains at the same high level. The enormous death-rate is

significant of local conditions of overcrowding, against which there is at present no legislation. The prevalence of tuberculosis bears little relation to climate, but is common wherever man closely aggregates. The spit of consumptives, being infectious, should only be received into receptacles which can be burnt or boiled, or the contents destroyed by strong antiseptics, fire, or boiling water. It is probable that most cases of tuberculosis of the lungs are contracted by breathing the infected droplets ejected by infected persons during coughing, sneezing and speaking.

It is hoped, as soon as small-pox is practically exterminated, to engage in a campaign against tuberculosis among the Chinese. The establishment of a Tuberculosis Dispensary in connection with one or more of the Sub-district Health Offices, where treatment and advice as to preventing the communication of the disease to others could be given, would be the first step. As soon as confidence is established and co-operation gained there would be need of a hospital for advanced cases and a sanatorium for curable cases.

Plague.

Plague-infected rats were found in December, 1908. A complete plague survey of the Settlement has been maintained since. During 1912 14,988 rats were found dead and brought to the Laboratory for examination, and of these 95 were plague-infected, compared with 187, 249 and 138 during the three preceding years. During the year nearly 154,000 rats were trapped and burnt. These, with the rats found dead and examined for plague, brought the total number of rats visibly accounted for to 168,988. In addition to the trapping, close on six million phosphorus baits were laid, about a ton of poison being used, which proved a powerful method in dealing rapidly with infected foci. Poisoning on so large a scale carried with it certain risks, but, since using poisoned cubes coloured bright blue instead of the usual method of spreading the poison on bread, no cases of adventitious poisoning have been reported. 1,597 houses, in plague foci, were temporarily rat-proofed and pulicidally disinfected; bedding, &c., being passed through the steam disinfector. This temporary rat-proofing included the plastering up of rat holes, bricking up and wire-netting places permitting ingress of rats into houses; the furniture of the house being removed to permit of thorough examination for rat holes and runs.

During October special inspection was placed on a part of the No. 2 Central Sub-district where six plague-infected rats occurred in rapid succession at a time when the remainder of the Settlement had been completely free from rat infection for three months. This same focus was previously infected in 1909 and 1910. The discovery of a human case of plague on November 2 was not, therefore, wholly unexpected, and tended to confirm the extent of the rat infection and the efficacy of the present method of plague survey by daily examination for plague in the Laboratory of rats found dead in all the areas into which the Settlement is divided for sanitary purposes. Between November 2 and 19, seventeen cases of bubonic plague arose within an area limited by the Nanking, Fokien, Peking and Shanse Roads. The first cases were discovered in the ordinary course of sanitary inspection and the disease confirmed by laboratory examination. The Director of the Chinese Public Isolation Hospital then offered, according to an arrangement previously made, to send his staff of Chinese doctors to carry out house-to-house inspection within the infected area with a view to the discovery of cases, isolation and treatment. The arrangement was carried out with cordial co-operation. On the occurrence of the first human case of plague the rat-proofing staff was concentrated on this area, so that by the end of the year 893 houses in the infected area had been permanently rat-proofed, over 200 men being, at one time, employed on this work. The average cost of rat-proofing these houses was $11. No further cases were reported in this area subsequent to December 19. The measures adopted were carried out with an almost complete absence of that sanitary hysteria which sometimes characterizes an outbreak of this dread disease. The inhabitants of the infected area showed no active opposition to the measures taken, a circumstance which was to some extent due to the lectures which were given in various parts of the infected area daily explaining the reason for the measures taken. There were rumours that the outbreak was one of pneumonic plague because of the occurrence of secondary pneumonic symptoms in some of the cases, and it was feared that the epidemic of pneumonic plague which broke out about this time two years ago in Manchuria might be repeated in Shanghai. The outbreak, however, conformed to the usual bubonic type. The conditions in Shanghai, though not making the occurrence of an epidemic of pneumonic plague impossible, through the overcrowding which prevails, are not comparable with the exceptional conditions obtaining during the Manchurian winter.

A case of plague occurred on December 10 at 19, Yunnan Road, near the junction of the Yangkingpang and the Defence creek, a place where plague-infected rats had from time to time been found. During subsequent rat-proofing operations three plague-infected rats were found in hollow ceilings and two below hollow floors.

As a result of the extensive rat-proofing operations in the Northern District during the last two years, some 5,265 houses being done, a gratifying reduction of plague-infected rats has resulted; during the last quarter of 1910 there were 126 plague-infected rats found, while during the same quarter of 1912 only 4 were found. An unsatisfactory circumstance at present attending plague prevention measures lies in the fact that new houses are being erected in accordance with the Chinese Building Rules, which, as they contain ceilings, afford ample facilities for rats to live and multiply within the houses and become a source of plague. Indeed, the first cases of the above outbreak occurred in an alley of new houses with solid ground

floors but which had ceilings. In the space enclosed by the lower ceiling, which was subsequently removed with the permission of the landlord, dead rats were found which had undoubtedly been the cause of the plague cases. The hollow space enclosed by the lower ceiling is a place much frequented by rats and one where they are the greatest danger through proximity to the beds of the occupants. There can be no question now that if Shanghai is to be kept free from plague, lower ceilings in Chinese houses should not be permitted except in special cases. A very large number of both upper and lower ceilings have been removed during the present year from old houses in plague-infected areas with scarcely any complaint except in the case of the upper ceiling. Property owners and architects are respectfully requested to inspect these houses where ceilings have been removed with a view to confirming the truth of these statements. If, as a result of this, the approval is obtained of an amendment of the Chinese Building Rules to omit the lower ceiling in the majority of Chinese houses a sanitary danger of the first importance will be removed.

The corrugated iron rat-proof barrier against Chapei erected in August, 1911, was removed in September, 1912, an effective barrier of rat-proof houses along the boundary of the Settlement having been made.

A plague preventive measure of considerable permanent value has been the erection of rat-proof house refuse receptacles on Chinese property. A marked improvement in the cleanliness of alleys has resulted. It will be apparent that rats will thus be deprived of a vast store of nourishment and, as the rat population is to a large extent regulated by the amount of the available food supply, this is held to be a radical plague-preventive measure.

Although the initial cost of permanent rat-proofing is comparatively large, yet, if adequate building rules are promulgated and new houses built in accordance with the requirements of modern sanitation, not only will it be possible to gradually reduce to extinction the present large plague prevention staff, but this measure of permanently rat-proofing houses forms the greatest insurance against plague in the future, and is, in fact, the only permanent safeguard. A house permanently rat-proofed is not only a healthier one to live in, but is an almost certain guarantee against bubonic plague to the inmates.

Of the rats examined in the Laboratory, about 70 per cent. were *Mus rattus* and the remainder *Mus decumanus—rattus* being the black or ship rat, which usually lives in houses; and *decumanus*, the brown or sewer rat. *Mus rattus* largely preponderated among those plague-infected. Of the fleas, *Xenopsylla cheopis* and *Ceratophyllus fasciatus* have been identified, the former being the flea usually associated with the spread of plague from rat to man.

In formulating anti-plague measures the rat has been the chief objective, as it is held that the rat is the essential cause of epidemics, the flea being the carrier of infection from rat to rat and from rat to man, infection from human cases, which is practically limited to the few pneumonic cases which usually arise, being comparatively rare. The dictum "No rats, no plague" has been taken as a working basis, and a house that is rat-proof has been considered for all practical purposes plague-proof.

The following is a summary of measures put into operation:—

Public Measures.

(1) Plague survey by enquiry into the cause of human deaths and by collection of rats found dead throughout the Settlement for examination in the laboratory in order to locate plague infection. (2) Careful daily collection and disposal of house refuse from every house and storage of house refuse in rat-proof receptacles so as to deprive rats of means of sustenance. (3) Rat-proofing of houses: (*a*) Temporary, by service of notice on occupiers asking for co-operation in cleansing, pulicidal disinfection, demurization and rat-proofing by minor repairs, &c.; (*b*) Permanent, by service of notice on owners requiring solid ground floors, removal of ceilings and hollow partitions and stair linings so as to deprive rats of accommodation. (4) Rat destruction by trapping and poison in infected areas beginning at the periphery and working towards the centre. (5) Preventive inoculation with plague vaccine beginning with the sanitary staff.

Individual Measures.

No rats. No plague. A house that is rat-proof is plague-proof. (1) Keep cats. (2) Rid your house from rats by trapping and poisoning. (3) Make your house as rat-proof as possible. (4) Provide no food for rats. Keep all food in places inaccessible to rats. Grain and such like food for ponies, fowls, &c., should be kept in covered galvanized iron receptacles. See that your servants keep their rice bags where rats cannot get. Keep house-refuse in properly covered galvanized iron receptacles and see that they are covered, especially at night. Keep the kitchen and its surroundings very clean; let no refuse lie about. (5) See that the gratings into the space below the ground floor keep out rats, and that the brickwork of the basement is impervious to rats. If rats gain access through windows or other openings on the ground floor keep them out by screening with wire-netting or perforated zinc. (6) See that all openings into covered drains are kept in good repair to prevent egress of sewer rats. Carefully inspect all corners of the house from top to bottom once weekly, moving furniture where necessary. Do the same in the stable, fowl-house, and other out-houses. Arrange for the plastering up of rat-holes or any place that may afford ingress to rats and mice. (7) All rats trapped or poisoned should be burnt; other rats found dead in or about the house should not be touched with the hands, but should be picked up with tongs, put into Jeyes' fluid and water (1 in 20) and sent to the Health Officer for examination for plague. (8) Get vaccinated against plague if exposed to infection. (9) If you have any difficulty in carrying out the above measures communicate with the Health Officer in writing.

Malaria.

A comparatively small number of cases of malarial fever, mostly of the benign tertian type, are contracted in and around Shanghai.

Periodic examination has been made of mosquitoes collected from each of the sanitary districts into which the Settlement is divided, and the following have been found: *Myzorhynchus sinensis* (malaria bearing), *Stegomyia scutellaris* (yellow fever bearing), *Culex fatigans* (the host of filaria), and *Armigeres ventralis*.

The prophylaxis of malaria resolves itself into: (1) Suppression of mosquitoes; (2) prevention of infection of man by mosquitoes; (3) prevention of infection of mosquitoes by man.

Every effort should be made by householders to do away with all receptacles of stagnant water,

where mosquitoes breed, such as ponds, water-plants, drains out of repair, abandoned tubs, pots, tins and what not. The mosquito net should be assiduously used whenever there are mosquitoes, and especially in up-country houseboat trips. It is doubly necessary to surround a person suffering from malaria with mosquito netting to prevent mosquitoes being infected and acting as carriers of infection.

An account of the special mosquito extermination work will be found later under that heading.

Beriberi.

The incidence of beriberi among the municipal prisoners has diminished. The cause of this disease remains under close observation, though up to the present wrapt in obscurity. The evidence preponderates in favour of the disease being an infective one having no direct relation to food but infective through body vermin. The recommendations regarding the admission of municipal prisoners will, if carefully carried out, settle the latter point. At the gaol there were 2 cases as against 27, 34, 134, 0, 0, 2, 2, 2, 1, 5, 78, 16 and 7 in succeeding years since 1899; such improvement being held to be attributable to the measures of disinfestation of body vermin among the convicts.

Dysentery.

Dysentery, with liver abscess as a not infrequent sequel, continued prevalent. It would appear that, unlike the type of dysentery prevalent in Japan which is bacillary in origin, of relatively greater fatality and unattended by liver abscess, that which occurs in Shanghai is mostly amœbic in origin and prone to produce liver abscess. As regards prevention the remarks made under cholera apply with equal force to dysentery.

Acute Lobar Pneumonia.

This disease, which was rare prior to 1898, has in subsequent years caused 8, 0, 8, 2, 2, 6, 4, 1, 10, 4, 3, 4, 4 and 4 deaths respectively among resident foreigners.

Rabies.

Ten persons were bitten by rabid dogs within the Settlement during the year and subsequently underwent the Pasteur treatment. The virus of rabies in Shanghai dogs is of an exceptionally intense character, the period of incubation being shorter than the rabies met with in dogs in Europe.

Leprosy.

Leprosy is a disease which so seldom concerns foreigners in Shanghai that its study is somewhat neglected. Cases are met with occasionally, though it seldom figures in the death statistics of either foreigners or Chinese. There appears to be no urgent call for special preventive measures.

Dengue.

From its home in the Malay Archipelago, dengue has frequently during recent years spread up the coast ports to Shanghai. It very rarely kills, but frequently incapacitates from work a large section of the community. It is an intensely infectious disease, spreading in mass like influenza, but appears not to be spread by contagion.

Relapsing Fever.

Relapsing fever again made its appearance among municipal prisoners. The examination in the Laboratory of the blood from certain fever cases has shown that relapsing fever is probably quite common among the Chinese population and occurs also to some extent among foreigners. This fever is much more prevalent in Shanghai than has hitherto been supposed, a circumstance which may help in the future to clear up certain obscure cases of fever.

It is probable that infection is determined by the presence of body vermin and measures which ensure their destruction will prevent the disease spreading.

Cattle Plague.

Cattle plague prevailed extensively in the dairies during the year. The mode of incidence appears to show that its origin is not in food, nor is the infection carried by the coolies, but that insects are the probable means of spread. Immunization by Koch's gall method is usually available from the Municipal Laboratory but is seldom taken advantage of. The ordinary preventive measures of isolating sick animals and thorough disinfection were carried out so far as possible.

Kölle and Turner's simultaneous method of immunization by virulent cattle plague blood and immune serum can be recommended as producing a greater degree of immunity than the gall method, but its application is more difficult and there may be some slight loss of cattle as a direct result. There can be no doubt that were dairymen to have their cattle thus immunized they would be saved great subsequent financial loss from epizootics of cattle plague.

Three cattle were rejected for cattle plague at the slaughter-house during the year, as against 6, 12, 7, 56, 5 and 8 during the years immediately preceding.

Other parts of this very interesting report deal with sanitary inspection, food supplies and cemeteries. All interested should consult the original paper, as it is so full and clearly written that it may be looked upon as a model for sanitary reports in other parts of the world as well.

Notices to Correspondents.

1.—Manuscripts sent in cannot be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

THE METEOROLOGY OF MALARIA.

By MATTHEW D. O'CONNELL, M.D.

BELOW I give hourly records of meteorological conditions at Bombay for two complete periods of twenty-four hours in the season following the rains when malaria is prevalent. For these records I am indebted to the courtesy of the Director of the Government Observatories at Bombay.

For comparison I have placed opposite each hourly observation the nearest meteorological conditions which were found, by observation, to raise body temperature in the Lancashire cotton sheds. I have added to both the drying power of the air per 10 cubic feet in order to indicate the rate at which heat was being lost from the body by evaporation in each atmosphere.

	Hourly atmospheric conditions at Bombay				Atmospheric conditions which raised body temperature in the cotton sheds of Lancashire			Degree to which body temperature was raised in the cotton sheds		
	Temperature of air, F.		Drying power of air per 10 cub. ft.	Velocity of wind per hour	Temperature of air, F.		Drying power of air per 10 cub. ft.	Body temperature in the mouth, F.	Pulse	Respirations
Bombay, 1912	Dry	Wet	Grains	Miles	Dry	Wet	Grains			
September 15, 1 o'c. a.m.	78·6°	75·4°	17	3	78·5°	73·5°	25	99·6°	116	22
,, 2 ,,	78·6	75·3	17	3	78·5	73·5	25	99·6	116	22
,, 3 ,,	78·3	75·1	14	4	78·5	73·5	25	99·6	116	22
,, 4 ,,	79·0	75·4	19	4	79·0	73·5	28	100·3	110	24
,, 5 ,,	78·9	75·4	18	4	79·0	73·5	28	100·3	110	24
,, 6 ,,	78·7	75·3	18	4	78·5	73·5	25	99·6	116	22
,, 7 ,,	79·2	75·5	19	4	79·0	73·5	28	100·3	110	24
,, 8 ,,	80·1	76·6	19	7	80·0	73·0	36	99·2	92	28
,, 9 ,,	81·9	77·7	24	4	82·0	75·0	38	99·2	92	16
,, 10 ,,	81·7	77·2	26	4	81·5	75·5	32	100·2	112	31
,, 11 ,,	81·9	76·9	27	5	82·0	75·0	38	99·2	92	16
,, 12 o'c. noon	83·0	76·7	35	7	83·0	75·0	43	99·3	92	16
,, 1 o'c. p.m.	84·2	75·9	50	10	84·0	77·0	39	100·3	84	25
,, 2 ,,	85·0	76·5	47	11	85·0	77·0	45	100·4	120	24
,, 3 ,,	85·0	77·2	44	9	85·0	77·0	45	100·4	120	24
,, 4 ,,	84·6	76·1	47	10	84·5	77·0	42	100·6	96	26
,, 5 ,,	83·5	75·1	46	8	83·5	74·0	50	99·8	116	20
,, 6 ,,	81·9	74·4	40	9	82·0	75·0	38	99·2	92	16
,, 7 ,,	81·2	74·3	36	8	81·0	74·0	37	99·9	120	20
,, 8 ,,	80·8	74·2	35	7	81·0	74·0	37	99·9	120	20
,, 9 ,,	80·4	73·7	35	7	80·5	73·0	32	99·6	92	20
,, 10 ,,	80·3	74·1	33	7	80·5	73·0	32	99·6	92	20
,, 11 ,,	79·7	73·8	31	8	79·5	74·5	26	100·2	90	24
,, 12 o'c. midnight	79·8	75·0	25	8	80·0	75·0	27	99·2	92	28

	Hourly atmospheric conditions at Bombay				Atmospheric conditions which raised b dy temperature in the cotton sheds of Lancashire			Degree to which body temperature was raised in the cotton sheds		
	Temperature of air, F.		Drying power of air per 10 cub. ft.	Velocity of wind per hour	Temperature of air, F.		Drying power of air per 10 cub. ft.	Body temperature in the mouth, F.	Pulse	Respirations
Bombay, 1912	Dry	Wet	Grains	Miles	Dry	Wet	Grains			
October 15, 1o'c. a m.	79·5°	77·5°	11·0	4	79·5°	74·5°	26·5	100·2°	90	24
,, 2 ,,	79·0	76·9	11·5	1	79·0	73·5	28·0	100·3	110	24
,, 3 ,,	79·0	77 0	11·0	3	79·0	73·5	28·0	100·3	110	24
,, 4 ,,	79 2	76·9	12·7	5	79·0	73·5	28 0	100·3	110	24
,, 5 ,,	78·9	77·0	10·5	4	79·0	73·5	25·5	100·3	110	24
,, 6 ,,	79·1	76·9	12 1	4	79·0	73·5	28·0	100·3	110	24
,, 7 ,,	79·3	76·9	12 7	1	79·5	74·5	28·0	100·2	90	24
,, 8 ,,	80·6	77·5	17·5	3	80·5	73·0	38·5	99·6	92	20
,, 9 ,,	82·3	77·8	25·8	1	82·0	76·0	33·0	99·2	88	14
,, 10 ,,	84·0	79·0	30·0	3	84·0	77·0	39·0	100·3	84	25
,, 11 ,,	85·6	77·4	47·0	4	85·5	78·0	44·0	100·1	82	22
,, 12 o'c. noon	86·2	80·0	38·2	6	86·0	77·5	49·0	99·2	80	20
,, 1 o'c. p.m.	86 3	79·3	42·3	6	86·5	79·5	42·5	99·2	92	16
,, 2 ,,	87·5	80·8	42·0	7	87·2	76·0	63·0	100·4	100	20
,, 3 ,,	87·6	80·9	42·1	7	87·2	76·0	63·0	100·4	100	20
,, 4 ,,	86·7	80·3	39·4	7	86·5	79·5	42·5	99·2	92	16
,, 5 ,,	85·6	80·2	33·4	5	85 5	78·0	44·0	100·1	82	22
,, 6 ,,	84·1	79·3	28·8	4	84 0	77·0	39·0	100·3	84	25
,, 7 ,,	83·5	79·0	26·0	4	83·5	77·5	34·5	100 1	100	20
,, 8 ,,	83·1	78·8	24·8	4	83·0	74·0	47·0	99·8	104	21
,, 9 ,,	82·4	78·6	22·0	1	82·0	76·0	33·0	99·2	88	14
,, 10 ,,	82·0	78·2	22·0	4	82·0	76·0	33·0	99·2	88	14
,, 11 ,,	81·3	76·7	25·3	3	81·5	75·5	32·5	100·2	112	31
,, 12 o'c. midnight	80·6	76·3	23·5	7	80·5	73·0	38·5	99·6	92	20

The explanation of the manner in which atmospheric conditions such as the above produce an intermittent fever, with increased destruction of red blood corpuscles and enlargement of the spleen, need not be here repeated. It has already been

given in the JOURNAL OF TROPICAL MEDICINE AND HYGIENE of September 1, 1913, with special reference to Calcutta, and in previous issues of the Journal with special reference to Lahore, Allahabad, Madras, Ceylon and Singapore.

REPORT OF EPIDEMIOLOGICAL SURVEY AND INVESTIGATION INTO PROBABLE CAUSES OF SICKNESS AMONGST MULES ON PLANTATIONS BATH, BLAIRMONT, PROVIDENCE AND SPRINGLANDS, BRITISH GUIANA.

By E. P. MINETT, M.D.

Assistant Government Bacteriologist.

From the Government Public Health Department, Georgetown, British Guiana.

HISTORY.

THE first cases appeared to have occurred amongst the horses owned by a man named Joseph, near Plantation Bath, who lost four or five horses about the month of August, 1912, all creole horses and all bred locally.

The next cases occurred amongst the horses owned by a man named Ram Persaud in the same district, near Plantation Bath, in September, 1912. He lost eight horses, at intervals of about a few days, out of a total of fourteen animals affected.

The mules on Plantation Bath appear to have been first affected early in October, 1912, during grinding operations on the estate; a total of forty-six mules were affected, of which thirty-five died during a period of about twelve months; the most severe cases dying in five weeks and the more chronic ones taking as long as six months.

On Plantation Blairmont the grinding finished in February, 1913, and this estate lost three mules and two horses out of a total of about eight or ten mules and four horses affected, the total number of animals on the estate being thirty mules and four horses. The sickness started early in May, 1913. The mules had mixed freely with the Bath animals during the previous six months.

At Plantation Springlands eleven mules were loaned to Plantation Bath to assist in getting off the crops of that estate. The mules returned to Plantation Springlands about the end of March, 1913. The first case of sickness occurred about April 9, 1913, and of a total of thirteen mules and two ponies affected four mules and one pony died.

At Plantation Providence sixteen mules were loaned to Plantation Bath for three months; these animals returned home in March, 1913; the whole of these animals were isolated for six weeks after their return from Plantation Bath. About May, 1913, eight animals appeared to be affected and were isolated. Of these animals two died in June and two in July, 1913.

INCUBATION PERIOD.

Very uncertain, but would appear to be a matter of several weeks in most cases.

DESCRIPTION OF DISEASE.

The accounts of the clinical symptoms given by the various observers interviewed tally so closely that there can be little doubt as to the identity of the disease in each case. The main symptoms observed were briefly as follows: Loss of condition; pyrexia associated with a very slow pulse; progressive anæmia; paralysis of hind legs; paresis of hind quarters; weakness; hæmoglobinuria in a small percentage of the cases (33 per cent. one estate), in others it appears to have been transient only. The animals gradually became comatose and died quietly. No convulsions seem to have been present. Jaundice was seldom observed. Hæmorrhages into the conjunctiva appear to have been fairly frequent. Incontinence of urine was present in a fair proportion of cases, and several observers noticed that after micturition the animals experienced considerable difficulty in retracting the penis, and in some cases the rectal mucous membrane after defæcation. Temperatures taken by me ranged from 98° F. to 101° F., but I was informed they had previously been up to 105° F.

DURATION OF ILLNESS.

The more severe cases appear to have proved fatal in about three weeks after onset of symptoms, but the chronic cases ran a course of six months and over before proving fatal.

MORBID ANATOMY.

Post-mortem examinations have been made in three cases, and I am indebted to Captain Farrant, F.R.C.V.S., for particulars of the two carried out by him; they differ in no important particular from my own observations.

The internal organs generally were anæmic, and hæmorrhages were present under the pleura, pericardium and the serous coat of the intestine. The kidneys were very pale and anæmic, but the capsules stripped well; a few hæmorrhages under capsule. There were hæmorrhages under the capsule of the liver and in one case jaundice was present. The spleen did not appear specially enlarged in any case, a few hæmorrhages were present under the capsule and in the substance also; in one case old perisplenitis appears to have been present. The brain, spinal cord, cerebrospinal fluid and meninges appeared normal in all these cases. In one case a clot of blood was observed over the optic thalamus.

MICROSCOPIC AND LABORATORY EXAMINATIONS.

Fresh blood was examined immediately after being drawn from the mule. No flagellates were detected.

Fresh Brain-squash.—A fair quantity of pigment detected in the capillaries.

Fresh Cerebrospinal Fluid.—Nothing of an abnormal character detected.

Stained Spleen-smear.—A large amount of pigment present, with degenerated red blood cells.

Stained Blood-slides.—A general anæmia, with

fair number of polymorphonuclear and large mononuclear cells present. No flagellates or other protozoa detected.

The following investigations were carried out on my return to the laboratory:—

Meningococcus.—Sterile glucose broth inoculated with cerebrospinal fluid with aseptic precautions as far as possible at time of *post-mortem*. Subsequently plated out in blood agar plates and colonies investigated. The remainder of the broth was centrifugalized; part of the deposit again plated in blood agar; the remainder spread on a glass slide and examined by Gram's stain. The presence of *Staphylococcus albus* only was detected. The *Diplococcus intracellularis meningitidis* was not detected.

Cerebrospinal Fluid.—A quantity of cerebrospinal fluid was obtained from the subdural space with a sterile pipette and preserved in sterilized normal saline.

Cultivations failed to show the meningococcus.

Centrifugalized deposit showed the cells present in normal human cerebrospinal fluid only. No excess of polymorphonuclear cells detected. No meningococci detected in cultivation or deposit.

Blood.—About 5 c.c. of blood was drawn off during life into sterile sodium citrate solution. Direct examination of the fluid failed to show the presence of flagellate forms of protozoa. The centrifugalized deposit suitably stained failed to show the presence of a meningococcus, a trypanosome or a piroplasma. Forty blood-smears obtained from ten mules showing a degree of pyrexia varying from 99° F. to 101·5° F. were microscopically examined. No trypanosomes were detected.

Pathology.

Portions of brain, spinal cord, spleen, liver, kidneys, lung and intestines were preserved in sublimate alcohol, subsequently prepared, and sections cut in the laboratory for examination.

The kidneys showed a small amount of cloudy swelling in the urinary tubules. The spleen showed a large amount of pigment and degenerated blood cells present.

The spinal cord appeared normal except for a small amount of small round-celled infiltration surrounding the blood capillaries. No pus cells were detected nor meningococci.

A similar condition was observed in a section taken from the base of the brain.

Ticks.

A large number of ticks were removed from infected mules. The contents of the intestines of several which were gorged with blood were examined for flagellates, protozoa, &c. The ticks examined were of the sub-family Ixodinæ (genus *Ixodes*).

Biting Flies.

The contents of the intestines from several flies caught whilst sucking blood from infected mules were examined as above. The flies examined were of the family Muscidæ (genus *Stomoxys*) and the family Tabanidæ (genus *Tabanus*).

Summary.

The failure to detect the presence of the *Diplococcus intracellularis meningitidis* (Weichselbaum), together with the normal condition of the cerebrospinal fluid, both as regards the absence of the organism and the character of its cellular elements, is opposed to the diagnosis of epidemic cerebrospinal meningitis. This conclusion is supported by the microscopic appearances of the spinal cords and brain examined, apart from clinical symptoms, on which point I am unable to give an opinion. But the history of the outbreak, the varying time between exposure to infection and the onset of symptoms, together with the marked anæmia, and occasional and transient hæmoglobinuria, would seem to point to an insect-carried disease of a chronic nature. The clinical symptoms closely correspond to the disease known as *mal de Caderas*, and to a lesser degree to the disease known as *Babesiasis equi*. The former disease is caused by *Trypanosoma equinum* and is supposed to be conveyed by means of a biting fly. The latter disease is caused by the presence in the blood of *Piroplasma equi*, and is conveyed to animals by means of the tick.

Unfortunately, I have been unable to demonstrate either of these organisms as present, but the failure to do so may possibly lie in the fact that these organisms are not present in the blood at all stages of the disease.

Prophylaxis.

Fortunately in all the above diseases the prophylactic measures are identical, and are briefly as follows:—

(1) Isolation of infected animals.

(2) Thorough cleaning of stables with crude paraffin and subsequent lime-whiting with a lime-wash containing an antiseptic (5 per cent. crude carbolic acid is suggested).

(3) Thorough burning off of infected pastures.

(4) Adoption of the two or three paddock system for segregating subsequent cases that may occur.

(5) The systematic and regular use of an insecticide on the animals, especially before crossing pastures suspected to be infected.

A suitable wash for animals is as follows:—

Soft soap	...	...	½ lb.
Water	...	...	½ gal.

Dissolve the soap in the water and add, with constant stirring, two gallons crude petroleum or paraffin.

(6) The harness should be treated with a similar mixture.

I beg to tender sincere thanks for assistance in this investigation to W. M. B. Shields, Esq., Captain Farrant, F.R.C.V.S., and the managers and overseers of the various estates visited.

Supplementary Report on Mule and Horse Disease in the County of Berbice.

A bay creole gelding was certified by Captain Farrant, F.R.C.V.S., as suffering from the disease known as *mal de Caderas*.

Blood-smears were taken from a recently infected animal during pyrexia, forwarded to the laboratory on September 24 and received here September 27.

On examination these slides show the presence of a large number of trypanosomes, which closely resemble the description given by Vosges in 1902 of a trypanosome named by him *Trypanosoma equinum*, and stated to be the cause of the South American disease known as *mal de Caderas*. The principal characteristics of *Trypanosoma equinum* is that the kinetonucleus is extremely minute; this peculiarity is present in the specimens sent by Captain Farrant.

The presence of these trypanosomes in the peripheral blood of animals suffering from the acute stages of the disease is, in my opinion, conclusive evidence of the disease being undoubtedly *mal de Caderas*. The clinical symptoms have already been shown in a previous report to agree with the above-named disease in horses, which has been described in Argentina and Central South America.

This trypanosome was discovered by Elmassian, and described by Vosges. It can be inoculated into laboratory animals. Its mode of propagation is not well known, and seems to bear some relationship to the disease which kills the capybara (*Hydrochœrus capybara*); this animal appears to be the reservoir for the parasite. Dogs may be infected by eating diseased animals, the infection may then be spread to horses and mules. The transmitting agent is stated to be a biting fly, either a tabanus or stomoxys, or more probably both.

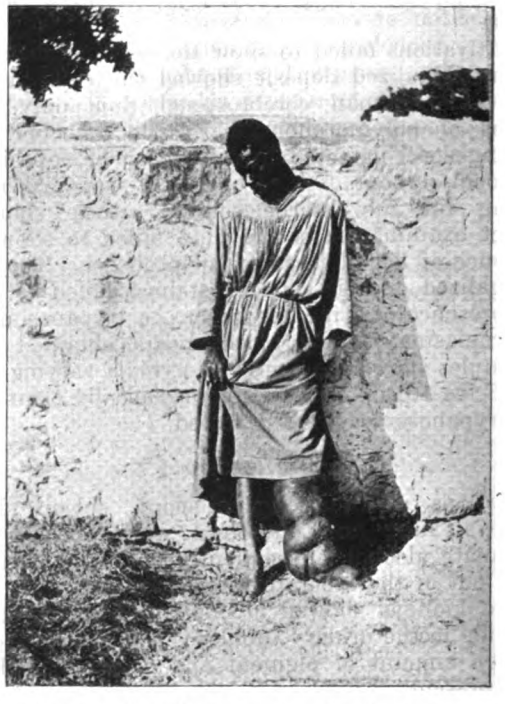
E. P. Minett, M.D.

SALVARSAN IN FILARIASIS.

By Edmund R. Branch, M.B., Ch.B.
Basseterre, St. Kitts, W.I.

For very many years I have been in the habit of treating cases of filariasis with different preparations of arsenic, giving it after the febrile stages, and continuing it on and off for several months. This treatment has proved successful in many cases to the extent of seemingly making the attacks much less frequent. I am, of course, aware that this treatment has been used by very many physicians with the same result; but no one has claimed to have effected a cure by it.

Arsenic no doubt has suggested itself in the past as a likely remedy for filariasis, owing to its well established value in chronic fevers and other obstinate morbid conditions, and as salvarsan has proved to be a most potent form for the introduction of arsenic into the human organism in the treatment of syphilis and frambœsia, the idea that it might be equally useful in filariasis naturally impresses itself on the mind. With this idea in view I selected a case in the Cunningham Hospital in which the two diseases, syphilis and filariasis, occurred together in very aggravated forms of long standing. An account of this case is to be found in the Report of the Vital Statistics for the Presidency of St. Kitts-Nevis for the year 1912. I may be excused for quoting this case here. "Filariasis.—There is now a woman in this hospital who has for several years been afflicted with tertiary syphilis in various forms. She is also an exceptionally great sufferer from filariasis, of which she gets an attack of the usual febrile type at least once a month. The calf of her right leg used to measure 16 in. in circumference when no exacerbation of the disease was present, and the calf of the left leg had, under similar circumstances, a girth of 13 in. There were also large freely suppurating ulcers, two or three in number, on the right foot. The negroes call these 'tubba sores,' and consider that they keep down the increased amount of the interstitial discharge. This woman has been getting salvarsan injections for the syphilis and has had 10 gr. of the drug. The 'tubba' sores have dried. There has been no



Photograph of the Case referred to in the text.

filarial fever for several weeks, and the circumference of the right leg has fallen from 16 to 14½ in. I have observed similar improvement in other syphilitic cases treated with salvarsan, which, as often happens here, where both diseases are so common, were afflicted also with elephantiasis."

From subsequent experience extending over nineteen cases during the last year, I have found the following points specially noteworthy:—

(1) The disappearance after treatment of the micro-filariæ in the blood.

(2) The discontinuance of the febrile attacks.

(3) The healing of ulcers, often of very chronic and indolent nature, and large size.

(4) The reduction, to the extent in some cases of many inches, in the circumference of long-standing and monstrous elephantoid limbs. In a few cases

where only slight swellings from elephantiasis were present these have entirely disappeared.

(5) The health of the patients in all these cases has improved notably from the treatment. As many of these have at the same time been sufferers from constitutional syphilis, the remarkable improvement in their health could not be attributed only or chiefly to the absence of filarial attacks; but in other instances, cases, uncomplicated with syphilis, have shown very marked improvement in their general health from the treatment by salvarsan.

It must be admitted that there have been some disappointments in the results of the salvarsan treatment for filariasis. There have been only two cases in which I have noted recurrence. In one of these cases there were no micro-filariæ to be found in the blood for three months after the first injections. In the first recurrence the febrile attack was exceedingly mild, and only a few micro-filariæ were discovered. A second treatment by salvarsan has been resorted to in this case, with no return of a filarial attack for the last four months. This case has lasted for many years, and is one in which the affected parts are monstrous in size and appearance. I enclose a photograph of it (*vide* p. 364).

It must be remembered that people who live in places where filariasis is endemic are constantly liable to recurrence from fresh invasions of the parasites.

I take this opportunity of expressing my indebtedness to Miss Alice Williams, the Matron of the Cunningham Hospital, St. Kitts, for her able and zealous assistance in such of these cases as were treated in that institution.

Relapsing Fever in Chitral.—Smith and Graham (*Indian Medical Gazette*, October, 1913) report on an epidemic of relapsing fever in Chitral with an account of successful animal inoculations. The outbreak, which was of epidemic form, first appeared among some remote Kafir villages on the Afghan frontier situated at some 7,000 ft. elevation. From the account of the villagers this appeared to be a disease which was previously unknown among them. There were no deaths, and recovery in two or three months was the rule, neither was there any history of sequelæ. None of these cases came to hospital for treatment, but slides of their blood showed very numerous spirochætes of a small type.

Inoculations of blood were made into young rats, the blood being passed into the subcutaneous tissues direct and not diluted with citrate. On the third day after inoculation spirochætes appeared in the blood of all of the three rats injected. The parasites persisted for two or three days, but then disappeared and were not found again. The authors believe that the success of these inoculations depended upon the three following points:—

(1) Young rats were used.

(2) Species of rat used (*Mus rattus*) was favourable.

(3) No citrate or other chemical was added to the blood used in inoculation.

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THE JOURNAL OF

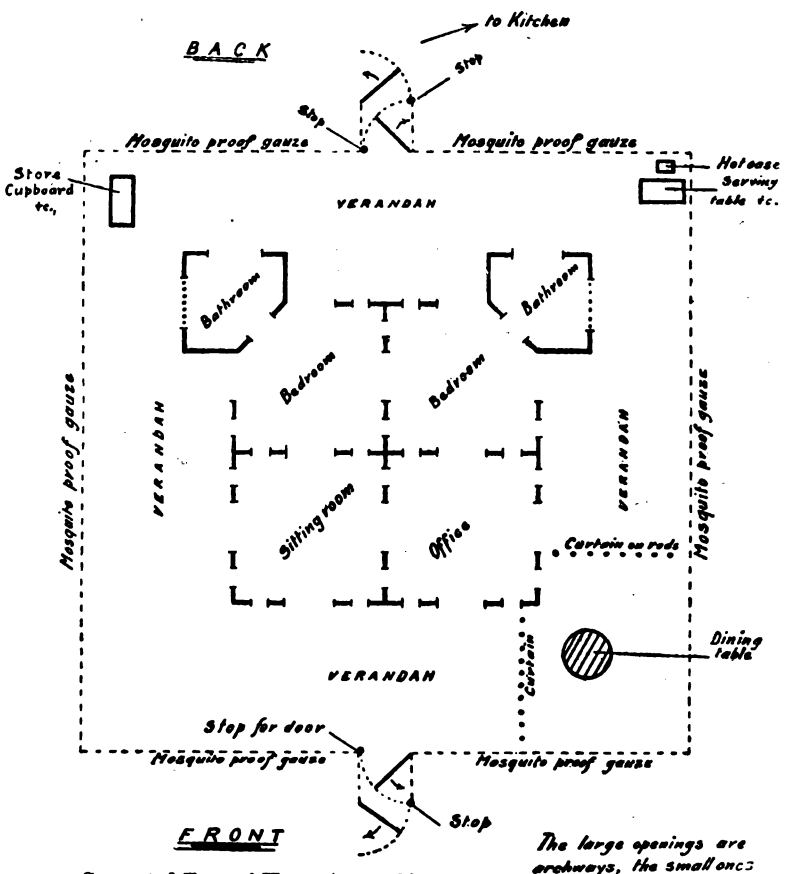
Tropical Medicine and Hygiene

DECEMBER 1, 1913.

A REPORT ON PRACTICAL SANITATION IN A DISTRICT OF CEYLON.

THE interesting and instructive report issued (1913) on malaria at the Port of Talaimannar, by S. P. James, M.D., D.P.H., and S. T. Gunasekara, M.R.C.S., L.R.C.P., should be carefully read by those practically engaged in the fight against malaria. Mannar is an island off the north-west coast of Ceylon, forming part of "Adam's Bridge," and the importance of the inquiry is that Talaimannar, in Mannar, is likely to be the port of the terminus of the new railway to India from Ceylon. The locality has always had an evil malarial reputation; it is, in general, not more than 12 ft. above mean sea level and mostly consists of a low-lying, sandy waste, covered here and there by scanty scrub jungle, palmyra groves, and a few coco-nut plantations, and throughout the area the subsoil water is so near the surface that despite the porous nature of the ground extensive tracts become flooded during the rainy season and remain so for several months. In the district the rainfall varies between 22 and 55 inches, and severe droughts may alternate with storms and floods. The variations in the meteorological conditions render alternate plenty and poverty possible, and the authors draw attention

to the fact that "it is usually the case in the Tropics that abnormal meteorological conditions of any kind are adverse to the population, and this is illustrated in the Mannar district by the fact that years of deficient rainfall are years of scarcity and hardship, while years of excessive rainfall are years of much sickness and mortality." The water supply of the district is derived from tanks, hollows, and primitive wells, in which fæcal pollution is the rule. The death-rate compared with the birth-rate is excessively high, but of this later. The cause of the sickness and mortality attributed to malaria, for between 50 and 60 per cent. of all the cases of sickness are ascribed to malaria or malarial cachexia, and to this infection may be ascribed such illnesses as those styled pyrexia, debility, dropsy, diarrhœa, convulsions in infants, &c.; the mortality directly due to malaria is stated to be 33 per cent. of the whole. October to January is the principal rainy season, and shortly after the onset of the rains brought down by the north-east monsoon malaria commences to increase in virulence, the maximum being reached in January and February, after which it gradually subsides until it reaches a low level in May. The chief proved (and it may be the only) carrier of malaria in the district is *Myzomyia culicifacies*, and this fact tends to simplify the possibility of dealing with the malaria problem in any district, for where there are many known carriers the difficulty and expense of exterminating them is great, whereas when war has to be waged against one species only it is materially lessened. It must not, however, be imagined that because carriers are few the infection of the population is necessarily small, for other factors enter into the question and perhaps none more so than poverty. When a community consisting of ill-fed and badly housed people are malarial, the effects of malaria are more severe and infection once contracted persists for a longer time, and a state of continual infection, known technically as "residual infection," obtains, with the result that a very few anopheles suffice to maintain a high degree of parasite infection.



Suggested Type of House (see p. 367).

An interesting point noticed and proved by the authors is that in villages where the population is fixed and permanent, the disease is chiefly confined to children, the spleen rate among the children in certain instances amounting to as much as 100 per cent. and the parasite rate to 50 per cent., while among the adults the spleen rate was only 15 per cent. and the parasite rate 8 per cent.—the discrepancy being due, no doubt, to the fact that the adults have become more or less immune by repeated and long-continued infections. On the other hand, the introduction of non-immune immigrants into the community alters the state of affairs; newly arrived adults become speedily infected, and if their numbers are considerable, fever prevails to an extent which deserves the term epidemic, and this outbreak among non-immunes may arise at a time when the number of anopheles are relatively few. The epidemic therefore becomes "one in which the 'human factor' rather than the 'anopheles factor' is the chief influence at work." The authors remark that conditions of this kind make the problems connected with the employment of outside labour in the district difficult, prevent colonization, and hinder progress generally. To the practical sanitarian, therefore, it naturally is suggested that local labour in a malarial district recommends itself, even although the population may be somewhat enfeebled by lifelong exposure to infection, in preference to imported non-immune labourers, who are almost certain to early succumb to the local malarial infection.

In addition to general sanitary attention to such subjects as the water supply, latrine accommoda-

tion, housing, &c., the authors advocate regular medical inspection of the coolies at least every fortnight. The medical officer should find out those suffering from fever, anæmia, and enlarged spleen, and the men thus affected should be treated in hospital; it is a mistake to allow patients suffering from malaria to remain in their huts, "not only because to do so is to give many anopheles an opportunity of becoming infected, but because, as a rule, in such camps the coolies who are ill are not strong enough and are too apathetic to prepare their own food, and they have no one else to prepare it for them." Uncared for cases of this kind add greatly to the mortality list.

The authors give details of the TYPE OF HOUSE, which should be at once airy, cool, and protected against the entry of mosquitoes, sufficiently substantial to resist storms, and proof against white ants. The house should be raised from the ground, preferably on an extensive plinth of concrete surfaced with cement; this is a most important recommendation, more especially for India and Ceylon, where the bungalows are built on the ground without elevation or subjacent concrete and the emanations from the earth penetrate the rooms directly through the ill-jointed flooring. The statement that "the whole area of the plinth should be utilized for the erection of a large mosquito-proof shed, inside which the house proper should be built," must be the last word in the protection of dwellings from mosquitoes. The description of the house is so good that it is reported here in detail. "The 'shed' consists of the following parts: (*a*) Pillars of iron, stone, or wood, erected at the corners and along the outer limits of the plinth to support the roof; (*b*) between the pillars a dwarf wall, and upon it a framework filled in with mosquito-proof copper wire gauze of 18 meshes to the inch; (*c*) at two places in the skeleton walls double doors, mosquito-proofed, and both opening outwards. They should be made to close automatically (N.B.—It is essential to the success of mosquito-proofed houses that all doors should open outwards); (*d*) a ceiling of wood or of asbestos material, resting on and closely applied to the top framework and girders in such a manner that the roof is completely shut off from the remainder of the shed; (*e*) a sun-proof and rain-proof roof, which is ventilated, and of which the eaves project as far as possible beyond the framework and are not provided with gutters—the rain dripping from them being allowed to fall into a concrete drain laid all round the house; (*f*) the result is a large square mosquito-proof structure with walls of mosquito-proof wire gauze, a ceiling of wood, and a floor of cement, and the whole covered by a roof; (*g*) all that now remains to be done is to reserve a broad space all round inside the structure to serve as a verandah, and then to partition off the remaining space into rooms. It is not necessary for these partitions to be very solid structures, and they should be opened wherever possible by large arches and windows. Doors to the arches are not necessary. It is important that no partition should be built which will cut off a through draft of air from front to back and from side to side of the house. (*h*) The house should be orientated so as to obtain the greatest advantage from the winds of the south-west and north-east monsoons."

The estimation of the relations of the death-rate to the birth-rate in almost all British Crown Colonies is a question fraught with difficulties; the chief being that the population consists of males out of all proportion to the females. In the Crown Colonies imported labour is the rule; the wives are left at home whilst hundreds or thousands of coolies flock to plantations abroad. Ceylon is constantly invaded by labourers from the mainland of India. Hong Kong, Singapore, the African Colonies, the West Indian Islands, and Guiana, &c., have a population sometimes amounting to ten men to one female. When, moreover, a woman becomes pregnant she frequently returns to her home to have her baby. Statistics gathered in the ordinary way from any of the above-mentioned places show a death-rate so disproportionate to the birth-rate that it would only require the passage of two generations to exterminate the inhabitants. The same applies to the region dealt with in the Mannar district of Ceylon, and due allowance must be made accordingly. In 1912, for instance, the birth-rate per mille in the Mannar district was 24·8, whilst the death-rate per mille is given as 49·5; it is evident that some interpretation is necessary to explain how the population is maintained at all; and the reference to the proportion of males to females in British Crown Colonies generally affords a clue to the discrepancy.

Isolation of Typhoid Bacilli from Fæces.—Browning, Gilmore, and Mackie, writing in the *Journal of Hygiene*, vol. xiii, No. 3, October, 1913, describe a method of isolating typhoid bacilli from fæces by means of brilliant green in fluid medium. They find that:—

(1) Brilliant green exerts an inhibitory effect on the growth of bacilli of the coli group commonly occurring in fæces, which is in general more marked than its action on *Bacillus typhosus* and paratyphoid bacilli.

(2) By taking advantage of this property of brilliant green a method has been devised for isolating *B. typhosus* from fæces. The procedure adopted is the inoculation of a series of tubes of peptone-water medium containing varying amounts of brilliant green, incubating for twenty to twenty-four hours, and then the inoculation on a suitable solid medium from each tube.

(3) The reason for employing a series of concentrations of brilliant green is that the optimum concentration for the growth and isolation of *B. typhosus* varies from case to case, depending probably both on the proportion of typhoid bacilli present and on the number and character of the accompanying bacteria as well as on the organic fæcal material.

(4) The method is very easily and rapidly carried out.

Abstracts.

SCHOOL QUININIZATION EXPERIMENTS IN THE UNITED PROVINCES.*

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THE various methods of quinine prophylaxis employed throughout the malarial world have one feature in common—their dependence for success upon some degree of discipline or control in the community being quininized. Organized communities such as jails and asylums, labour under such a considerable advantage in this respect that they are looked on as eminently suitable for the adoption of such measures, with a reasonable assurance of their being carried out in their entirety. When, however, one comes to deal with the civil community at large, the adoption of any scheme of prophylaxis on a large scale becomes difficult, if not impossible, both from the point of view of organization and from that of expense, while the results accruing are likely to be uncertain. In the civil community, however, the school organization comes perhaps nearest in point of discipline to the examples cited, and the scholars, while they are in actual attendance, can be controlled just as effectually. The experiment of prophylaxing the scholars in a selected number of schools in any district has then as desiderata in its favour the facts that the community concerned consists of children or young adults well organized and disciplined during seven hours of each school day, who are highly susceptible to malaria, and who are, moreover, in process of mental moulding, keenly observant, fairly unbiased, and in a position to remember any object lessons and perhaps retail them at home.

The first attempt at school quininization experimentation on systematic lines in the United Provinces was made in the district of Muttra by Major Robertson, I.M.S., in the rains of 1909, when the country was beginning to recover from the heavy toll that had been exacted by the epidemic of 1908. Muttra had been the worst affected of all the districts in the provinces, and the passing of the epidemic had left its mark on the bulk of the population under ten years, so the huge spleen indices, very large spleens, mixed infections and relapses were the features of the school examinations then undertaken. Though Major Robertson did not write a report on the experiment, the writer understands that he systematically quininized a large number of the worst schools during three months, and that, at the end of the period, the results were regarded as eminently satisfactory, and of sufficient value to suggest more detailed experiments on similar lines in the future. Such an experiment was undertaken by the author in the rains of 1910, in the district of Budaun, a district which had suffered severely during the epidemic of 1908, and where the district authorities seemed specially keen on working at the problem and on giving every assistance. The results of this experiment have been recorded in a "Report" addressed to Government in February, 1911, and since published.

In this report is recorded a full and detailed outline of the whole experiment with the conclusions arrived at, and, as the report was circulated throughout the province, every opportunity was given to the different district authorities to digest the details, and modify them to suit local requirements if they felt inclined. The results recorded were distinctly satisfactory; but, as the autumn of 1910 had not a severe malarial incidence, it was thought desirable to attempt on similar lines, in the autumn of 1911, the quininization of a series of schools in two badly affected districts, and the districts of Meerut and Aligarh were chosen. These districts, which are situated in the Jumna-Ganges Doab, are highly canalized areas, well supplied with schools, and very accessible, and have shown over a long period of years continued heavy mortality from endemic malaria, as well as very heavy mortality on occasions from epidemic malaria, so that they were considered eminently suitable. It is with this later experiment that the present paper chiefly deals.

General Arrangements.—In consultation with the district officers a typical series of school was selected, embracing practically all the district climatic peculiarities. Sample head lines of a quinine attendance register had been previously distributed throughout the schools to be visited, and by the time of the author's arrival, all schools had been provided with identical registers in which the scholars' names had been entered class by class. These registers showed columns for class number, name, sex, age, spleen, general health, dose, dates of dosage and remarks. Personal examination of every child in every school at the inception of the experiment, to note the size of spleen, general health, and age, and to fix a prophylactic dose calculated on age and physical development, though tedious, can rapidly be overtaken in these days of motor transit, whilst a similar personal examination at the termination of the experiment made the data complete and comparatively free from error, which they would not have been, had this been delegated to subordinates.

Distribution.—To eliminate as far as possible any local bias against the drug, its distribution was entrusted to two sub-assistant surgeons, for whom a weekly cyclical programme was drawn up, embracing the majority of the schools in each district, though a few schools because of their inaccessibility had to be entrusted to the sub-assistant surgeons at district dispensaries, whilst in several instances district sanitary officers assisted. In this

* Proceedings of the Third Meeting of the General Malaria Committee, held at Madras, November 18, 19, and 20, 1912. Simla: Government Central Branch Press, 1913.

way the general accuracy of the tabulated results was ensured, whilst each school was able to be seen twice weekly in 1911, a factor of some importance.

Quinine.—Quinine in the form of the sulphate in 1910, and of the bisulphate in 1911, was issued throughout all the experiments in uncoated tabloids of ½, 2, 3 and 5 gr., given dry, and washed down with water, and was swallowed without difficulty. The stock was kept in the 1910 experiment with the Civil Surgeon of Budaun, but in 1911 with the respective District Board Secretaries of Meerut and Aligarh, and was issued as required (usually weekly) to the distributors. Throughout the whole period very few cases of intolerance were reported, and conscientious objectors, though they existed and were respected, never established cases really worthy of consideration.

Dosage.—The question of dosage, the crux of any prophylactic experiment, was necessarily experimental, and was fixed as low as possible, and in many cases too close to the borderland of inefficiency. The adult dose was fixed at 18 gr. A useful method was evolved of adding 4 to the age and making this the denominator of a fraction, the numerator of which was the age. Thus for a boy aged 6, the fraction of the adult dose was $\frac{6}{6} + 4 = \frac{6}{10}$ or $\frac{3}{5}$, or about 10 gr. weekly. This was given irrespectively of evidences of malarial infection, such as enlarged spleen, general appearance or history. In the 1910 experiment single weekly doses and bi-weekly doses on successive days and on intervening days, with 8, 9, 10, 12, 15, 16 and 20 gr. weekly were tried, giving in all eleven bases of dosage; but in practice this was found by its multiplicity to confuse the issue. Accordingly, in the 1911 experiments, the weekly scale was limited to 12, 18 and 20 gr., and was given twice weekly either on successive days or with intervening days, giving in all five bases of dosage.

Girls' schools, which had been included in 1910, were excluded in 1911 because of the unreliability of the registers and the irregular attendance. The test extended over the three fever months, August, September, and October, and into November in one case, the final examination being concluded when the distribution had ceased.

Throughout the 1910 experiment. continuous weekly blood examination of proved gamete carriers was attempted, and gave some interesting information; but owing to paucity of gamete infections in 1911 it was abandoned. Local conditions were, however, considered much more in the 1911 experiment than previously in arranging the programme of schools, and also influenced to some extent the basis of dosage. This was attended with benefit.

The choice of schools in both Aligarh and Meerut was influenced to some extent by a perusal of the malaria intensity figures for thirty-two years of the rural circles of the districts, and the schools in both districts assort themselves into four groups:—

(*a*) A Khadir group.
(*b*) A canal or riverain group.
(*c*) A road group (2 miles at least from canals).
(*d*) A town or city group.

It is obvious that dosages only just sufficient to influence a group such as the city group would be hopelessly insufficient to prophylax effectively a group like the Khadir group, when it is remembered that the spleen indices of the two areas might vary between 5 per cent. and 60 per cent. An attempt to cope with this was made by putting all such highly endemic areas on the high scale of 18 or 20 gr., while the town group were kept on the lowest, 12 gr. In this way results were found to work out very uniformly.

The results obtained in the three districts were as follows:—

In Budaun in 1910, 54 schools with 2,881 scholars showed a decrease of spleens due to complete disappearance as measured by palpation of 58·4 per cent.; a control of 247 non-quininized boys enrolled after the experiment had begun showing 30 per cent. of spleens in November at a time when the quininized showed 7·6 per cent.

In Meerut in 1911, 45 schools with 2,648 scholars showed a decrease of spleens due to complete disappearance of 48·3 per cent.; a control of 702 non-quininized scholars enrolled after the experiment had begun showing 15 per cent. of spleens in November at a time when the quininized showed 7·6 per cent.

In Aligarh in 1911, 48 schools with 3,254 scholars showed a decrease of spleens due to complete disappearance of 56·8 per cent.; a control of 1,029 non-quininized boys enrolled after the experiment had begun showing 16·8 per cent. of spleens in November at a time when the quininized showed 7·8 per cent.

Briefly the spleen rate of the non-prophylaxed boys in November was practically the same as was that of the scholars in July, while the prophylaxed boys showed a reduction by complete disappearance of about 50 per cent. This happened with every basis of dosage, even though only a percentage varying from 79·7 to 88·3 of the available quinine was consumed.

Twelve grains in the city were found to produce much the same percentage of reduction as did 18 and 20 gr. in the canal and Khadir schools, *i.e.*, the proportionate reduction was much the same in all. By grouping the schools according to proximity of spleen indices in periods of ten units each—*i.e.*, schools with spleen index from 0 to 10, 10 to 20, and so on—one can contrast the dosage effects in comparable schools, and this shows that 18 gr. bi-weekly "intervening," and 20 gr. bi-weekly "intervening," are the most successful; but, as already pointed out, too much reliance should not be placed on any deductions one is tempted to make regarding efficiency of individual dosages, though the figures indicate that such doses as 18 and 20 gr., when employed under moderately severe endemic conditions, are of unquestionable utility in the reduction of individual enlarged spleens, when gauged by numbers sufficiently large to exclude numerical fallacies.

Dosage in Relation to Fever Incidence.—The influence of different dosages on fever incidence is

another of the primary tests which enable one to estimate the success of the prophylaxis. The percentage number of cases in which fever occurred during the exhibition of the drug will more than represent the measurement of failure to prophylax.

In Buduan, in 1910, failure to prophylax occurred in 10·6 per cent. of the pupils when 80·1 per cent. of the doses were consumed. In Meerut, in 1911, in 8 per cent. of the pupils with 81·3 per cent. of doses consumed, and in Aligarh, in 1911, in 9·4 per cent. of the pupils when 76·5 per cent. of doses were consumed.

In this connection one must allow for:—

(*a*) Previous latent infection.

(*b*) Irregular consumption of dosage.

(*c*) Defective diagnosis. As pointed out recently by Ross and Thomson in connection with their enumeration experiments, it can hardly be accepted, in the absence of accurate enumeration observations, that apparent rises of temperature during a period of quininization are necessarily relapses or even malaria, and this factor alone would go towards diminishing the apparent failure.

The point elicited, however, by the figures is that the author was sailing near the border line of inefficient prophylaxis, and further, that the more thorough the administration the less was the fever incidence and spleen development. In estimating the relative values of individual dosages, 18 and 20 gr. bi-weekly "intervening" would appear to give the best results, and this, too, when applied to the severely affected riverain, canal and Khadir areas. As had been repeatedly pointed out, it is premature to argue efficacy of a particular dosage over others, when local conditions vary so greatly. A careful study of the available figures brings out clearly the necessity for graduating doses according to locality, and so making the prophylaxis less empirical. In the Meerut district a 12-gr. dosage in the towns does apparently what an 18-gr. dosage does in the Khadir and riverain tracts. It would naturally be expected that an 18-gr. dosage would do more in the towns than a 12-gr. dosage. The present tests do not touch this, however, but the figures prove that all dosages are efficacious when exhibited intelligently.

Bloods.—In Budaun in 1910 the careful weekly examination of gamete carriers during the exhibition of the drug disclosed three conditions:—

(1) Gametes or other forms are found right through the fever season, even in cases where no absences are recorded, *i.e.*, where all the quinine available has been consumed. This is especially marked in malignant infections.

(2) Several infections, mostly benign tertian, seem to be controlled from the commencement, and to remain so till the end, even in spite of absences, and therefore diminished quinine consumption.

(3) Original infection is more or less controlled, but has a second infection, probably a reinfection, grafted on to it during the fever season.

Curiously, recurrence of old infection does not always seem to vary inversely as the number of doses as one would expect, but other factors, such as the general health, degree of infection, the amount of the dose, all enter in to complicate the issue.

In Meerut and Aligarh in 1911, regular observation of the blood of gamete carriers on the above lines was found impracticable. Though these schools showed spleen rates varying between 3·6 and 69·2 per cent., and 8·1 and 56·7 per cent., respectively, the blood infections discovered were few. Meerut showed 13·4 per cent. in July and 1·9 per cent. in October; Aligarh, 3·4 per cent. in August and 1 per cent. in November-December. The malignant parasite predominated. There is every sign that, despite the rainy season, not only did recrudescence not take place in the majority of latent carriers, but that actual infections also decreased, and it is more than likely that the quinine exhibited helped towards this result.

Evidence of Temporary Immunity.—Reference to school registers shows that the percentage absence due to fever, after quinine distribution ceased, was much greater than it was during the test—indicating that a degree of temporary immunity existed during the test.

Size of Spleen.—In the non-quininized scholars seen in November, the fresh spleens noted were proportionately larger than were those in the quininized scholars (*i.e.*, the increase in the non-quininized was greater than that in the quininized.

Teachers and Staff.—As the teachers form an adult community comparable in regard to age in all three experiments, they have been considered together. Five hundred and ten teachers in the three experiments consumed 92·6 per cent. of the available quinine, and showed only sixteen cases of fever, four of whom developed slight spleens. The average dose received was 14·1 gr. in Budaun, 18·2 gr. in Meerut, and 16·7 gr. in Aligarh. The figures show a high degree of prophylaxis.

Cost.—The expenditure involved in such experiments is a practical point which very often must decide for or against its adoption. The working expenses of Budaun in 1910, inclusive of the pay and travelling allowances of the special distributors, were approximately Rs. 1,163, or 6·5 annas per head; Meerut cost Rs. 1,360, or 6·2 annas per pupil: Aligarh, Rs. 1,725, or 7 annas per pupil. In all these instances the expenditure could be reduced to about one-half by depending on local distributors entirely; but in the tests the employment of special men for the purpose was valuable as ensuring increased accuracy of work. In the three experiments the District Boards supplied funds up to a certain amount, beyond which Government made a grant; but the fact that several District Boards have since and are at present financing their own programmes, bears out the author's contention, that, practically, the cost can be reduced to one-half that given, or roughly, to about 3·5 annas per pupil for the fever season.

Other Points.—It would be helpful in new districts first to ascertain the malarial conditions, both

from malaria intensity figures, if available, and by a perusal of local statistics, and in this way variation of dosage to suit locality could be made possible. As a rule 18 gr. should be the minimum weekly dosage for the adult male community, and, given bi-weekly with intervening days, it seems to afford the best results with the least disturbance; but, as a working rule, smaller doses could be given in large towns and dry areas away from canal irrigation. Registers should always be kept, as the mere fact of having a register makes the distribution appear part of the school curriculum, and ensures more care being taken over it.

Objects.—The author classes the objects of such a crusade under several heads.

(1) *Educative Value.*—To an active boy nothing can well be more impressive than an untreated attack of fever, which lays him low for several days, weakens him, and keeps him from his games and from school.

What must be the effect on a group of boys, all of whom are being quininized with success, when they see one of the class who has consistently refused the weekly dose, or who has been absent so often as to have received little or no prophylaxis, suddenly struck down or suffering severely from fever while they escape; yet this object-lesson time and again was demonstrated in class after class of the various schools. So marked was it that the masters very often came to associate frequent absence with indifferent prophylaxis and regular attendance with systematic dosage. Moreover, the illness of such boys must have formed a subject for common gossip both at home and in the play-ground, thus impressing the family circle with the value of the drug. The testimony to the increasing regularity of the attendances of the children in the rains since the tests were inaugurated was almost unanimous on the part of both teachers and parents whom the writer saw, and quinine and this regularity were placed in the relation of cause and effect, with some justification, by most of them.

(2) *Prophylactic and Destructive Aspects.*—Fresh infection or reinfection is thus prevented and the risks from latent carriers of infection are diminished.

(3) *Dosage and Therapeutic Aspect.*—Information regarding the variations of dosage which appear most efficacious and the local conditions requiring that these doses should be modified, is thus accumulated for future guidance, while the direct effect on actual infection by diminution of splenic enlargement and increased standard of general health is as important a consideration for children as it is for adults.

Applicability.—Any scheme on lines similar to those described can be initiated locally without such detailed examination as was made in these tests, and, with the help of the district authorities, can be run by an intelligent assistant surgeon or district sanitary officer, while the transition from a free issue of quinine in the first year, to, in the second year, a quinine register, for enrolment on which a small inclusive charge for the season could be exacted, is comparatively easy. This is all in progress at the present moment. Thus, in 1911, Budaun on its own initiative, after the success of 1910, carried through a similar experiment, when a proportion of the cost was borne by the scholars and the remainder by the District Board, and the register enrolment was actually greater than in the year of the test experiment, 1910. Budaun is again doing the same in 1912.

In addition, Meerut in 1912 is running a similar experiment with 5,561 boys and 199 teachers, the greater proportion of the cost of this quinine being recovered from the boys by a small fee for enrolment on the quinine register. No compulsion is being used. Another feature of the Meerut experiment this year is a graduated scale of dosage to meet the potentialities of different localities. This has been circulated to all headmasters throughout the district, and, as the distribution is in the hands of the masters, an attempt has thus been made to get at Khadir and outlying schools which would otherwise be beyond a special distributor's help. The energetic Secretary of the District Board in Meerut is responsible for this innovation. Aligarh and Muzaffarnagar are also carrying out register distribution on systematic lines this year at their own expense; while three other districts are running modified experiments. The popularity of these measures in severely affected tracts is undoubted, as on several occasions requests were made to have the distribution continued for another month after the date fixed for the completion of the test.

Conclusion.—It will thus be seen that as sickness from malaria is among the most frequent causes of irregular school attendance in the rainy season, that as with reliable uncoated tablets of quinine one has an elegant and exact means of administering a preventive and curative, that as during 1910 and 1911 its feasibility was demonstrated in three carefully applied tests, school quininization, as a general measure, has now passed the experimental stage, and the principle of its applicability for all district schools of the United Provinces of India and similarly affected areas during the rainy and fever season should now be accepted. That many districts may require less than others, and in some years none at all, is quite intelligible; but, once the principle has been accepted, individual districts, with the expert advice of their Civil Surgeons and others, could easily determine how far the principle should be applied.

The details of these reports should not blind district authorities to the fact that the mechanism is neither complicated nor expensive, that it can and has been conducted by district authorities for an entire season without any outside help, and that to obtain from it the maximum of benefit continuity from year to year in the same district is requisite.

[This is a most valuable and instructive paper and should be carefully studied by workers in other parts of the world as well as in India.]

QUARTERLY REPORT OF BUREAU OF HEALTH FOR THE PHILIPPINE ISLANDS.

Second Quarter, 1913.

By Victor G. Heiser, M.D.
Director of Health; Surgeon, United States Public Health Service.

In the above report it is stated that during the week ending April 26, 1913, there was a sharp increase in the number of plague cases reported in the city of Manila. Four deaths occurred within a period of seventy-two hours. These cases were reported from 334 Calle Padre Rada, 1,419 interior Calle Dagupan, 1,364 Calle Sande, and 642 Calle Ilaya, respectively. On further investigation it was ascertained that all of these deaths occurred in persons who worked in a silversmith's shop at 1,364 Calle Sande. They were all empoyed on the first floor, which was of cement. Ordinarily such construction would be regarded as rat-proof; but, owing to openings being found near the sides which resembled rat holes, and cracks across its surface, it was deemed advisable to tear out the floor, which was done, and several mummified rats were found underneath it, the death of which was probably due to plague, although this fact could not be definitely established. It was then deemed advisable to inquire into the health condition of the remaining persons who worked at this shop. This resulted in finding an employee at 1,492 interior Calle Dagupan with malaise, headache and fever. He was transferred to San Lazaro Plague Hospital, where soon after admission many of his glands became palpable. A definite diagnosis of plague was made, which was afterwards confirmed by autopsy. The foregoing experience illustrates in a striking manner the intimate relationship which exists between rat and human plague and that so-called rat-proof construction must be kept in good repair. In this instance there is reasonable ground for believing that after the rat host of the fleas had died the fleas made their way through the cracks in the cement floor and attacked the workers in the shop. In view of the fact that Javanese observers have reported that ants attack fleas, it may be of interest to state that there were large numbers of ants found under the cement floor. But as ants are almost invariably found near decaying animal matter, the dead rats may have attracted them. It is also of interest to note that these human cases occurred in a district which was reported a month previously as showing a decided increase in the percentage of rat infection. Infected rats are still being found in this section, but as there have been no plague cases since April, it is reasonable to infer that the anti-plague measures have been successful.

There were nine cases of plague during the quarter, of which seven died.

Apparent Cures of Leprosy.

On June 11 there were released from San Lazaro Hospital two persons who were formerly afflicted with leprosy and have now been pronounced free from the disease.

C. A., male, Filipino, aged 27, admitted to the San Lazaro Leper Hospital May 29, 1909. On admission the case presented thickened reddish spots on the nose and thickening and discoloration of the lobe of the right ear. Smears made from the lesions were positive for leprosy bacilli. Beginning August, 1909, he received vaccine treatment at intervals for one year, but apparently there was no change in his condition during this period. From September, 1910, to November, 1910, he took crude chaulmoogra oil by the mouth, beginning with daily 15-drop doses and by November reaching 60 drops per day. The oil was given three times daily in divided doses. From November he received hypodermic injections of the following mixture:—

Chaulmoogra oil	60 c.c.
Camphorated oil	60 c.c.
Resorcin	4 grm.

Mix and dissolve with the aid of heat on a water bath, and then filter.

The foregoing mixture was given as follows:—

During November	...	2 c.c. every	3 days.
,, December	...	5 c.c. ,,	8 ,,
,, January	...	10 c.c. ,,	8 ,,

As this large dose was being borne badly it was reduced to 5 c.c., which amount was injected every eight days from February to May. There was apparently no change in his condition at the end of the year following the vaccine treatment. During the treatment with crude chaulmoogra oil by mouth there was some improvement in his condition. This improvement continued during the time that hypodermic injections were given, and on May 6, 1911, all the lesions above described had disappeared and it was impossible to demonstrate the leprosy bacillus. All treatment was then discontinued for a period of one year, during which time he remained negative microscopically. From August, 1912, to June, 1913, 2 c.c. were given every ten or thirteen days until the time of discharge.

The second case was that of G. A., a Filipina woman, aged 22, admitted to the San Lazaro Leper Hospital on January 7, 1910. She had a generally suffused countenance and small red macules on the cheeks, forehead, and chin. Scrapings from these lesions were positive for leprosy bacilli. Vaccine treatment was begun January 15, and continued for a period of five months. At the end of the first month there was apparently no improvement in her condition, and crude chaulmoogra oil was given by mouth in ascending doses. The initial dose was 30 drops per day and had reached 300 drops at the end of four months. At the close of this period there was some apparent improvement, but the oil was no longer borne well, and the chaulmoogra oil mixture mentioned in the previous case was administered. For the first month 1 c.c. was injected into the buttocks every eight days. The next month 10 c.c. was injected every four days. Then one dose of 15 c.c. was given. After that 5 c.c. was injected every six days. By May 6, 1911, there was a great improvement in her general

appearance and she was microscopically negative for leprosy. During September, 1911, all treatment was discontinued for one year. Beginning June, 1912, 2 c.c. was injected every eight days. Microscopical examinations were made at frequent intervals and always with negative results. On June 11, the date of her discharge, all macules had disappeared, but there was still some suffusion of the countenance.

It is not known whether the vaccine treatment had any influence in these cures. It may be said, however, that there are a number of other cases at San Lazaro Leper Hospital and at the Culion Leper Colony that have been negative for nearly two years which presented more marked lesions than those already discharged, and yet they received only chaulmoogra oil, no vaccine being employed.

Apparent cures have been reported from time to time in the past from San Lazaro Hospital, but unfortunately all such cases relapsed or died from some intercurrent disease soon after they were negative for a period of one year. The cases now reported have been negative for a period of two years, and there seems to be ground for hope that the results may be more permanent.

As soon as the favourable results became generally known among the lepers there was a great demand to take similar treatment, and many hundreds are now taking chaulmoogra oil in some form or other.

Owing to the long period over which the oil must be taken and the nauseating effect when given by mouth, experience has shown that few have the hardihood to take the treatment faithfully over a prolonged period.

Up to the present time the results have not been such, Heiser believes, as to warrant the belief that a specific for leprosy has been found; but it is thought that if adequate funds were available for the opening of a laboratory for the study of this leprosy treatment, and an attached hospital provided which had facilities for making accurate observations, at least a way has been indicated which might eventually lead to success. In order that too great hopes may not be aroused by the present cures, it should be remembered that in the experience of the Bureau one leper has apparently recovered spontaneously—that is, without any treatment being administered—and that for a period of over a year now there have been twenty patients placed under the treatment mentioned above, but only a few of them have shown any signs of improvement.

THE FUTURE OF TROPICAL AMERICA.—The Tropical Exploitation Syndicate, Ltd., 28, Mincing Lane, E.C., have recently published a brochure on the future of tropical America. This clearly shows how the opening of the Panama Canal will benefit and improve all the States and Islands lying within its immediate range. The brochure is very well illustrated with excellent photographs, and should prove useful as a means of educating the laity in general.

Notes and News.

MEDICINE IN ANCIENT EGYPT.

AN EARLY PRESCRIPTION.

PROFESSOR ELLIOTT SMITH, in a lecture on October 30, 1913, before the Royal Society of Medicine, on "The Contributions of Ancient Egypt to the History of Medicine," said that the influence of mummification upon the history of medicine had been most profound, for the practice of embalming prepared the popular mind to permit the practice of human dissection. The Egyptians took no advantage of that training, but the Greeks did, and thus laid the foundations of true anatomy. In the past twenty years a number of new documents dealing with medicine had been discovered, and one which had never been published was as early a medical document as had ever been found. Professor Smith showed on the screen a copy of the papyrus in question, which dated back to 2000 B.C. The prescription was for the treatment of a man suffering from acute mania, and it explained that its purpose was to weaken a strong man's struggles. There was no malicious intent, it was added, in weakening him, but it was done for his good. The prescription contained fourteen different ingredients, which were to be made into an ointment. The patient was to be anointed fifteen times every day until he was calm.

Professor Smith stated that during his experience in Egypt he had examined 20,000 bodies. Some of the prehistoric bodies dating back sixty centuries were in a marvellous state of preservation, and even blood-stains could still be seen. He had discovered splints which went back to the time of the Pyramids. In the earliest cemetery ever excavated in Egypt they found that all the men had been circumcised. In the whole of his Egyptian experience he had found only one case of real gout, and one instance of leprosy, dating back to the early Christian period. During his first year's work he never saw the slightest trace of tubercle, but since then a few instances had been found, and they had now accumulated ten cases of evidence of tubercular disease. Only three cases had cropped up which could by any stretch of the imagination be described as syphilitic. If syphilis really existed in ancient Egypt, they had not yet seen any definite traces of it.

AN APPRECIATION.

IN referring to the recent death of Dr. W. H. Langley, Principal Medical Officer of Southern Nigeria, the Acting Administrator stated in the *Government Gazette* that, apart from great services Dr. Langley has rendered to West Africa as Deputy Principal Medical Officer in Northern Nigeria, as Principal Medical Officer of the Gold Coast Colony, and recently as Principal Medical Officer to Southern Nigeria, he can well be said to have endeared himself, by charm of manner and quality of mind, to all with whom he came in contact, whether officials or non-officials, throughout West Africa.

RETIREMENT OF DR. R. M. FORDE.

Dr. R. M. Forde, Principal Medical Officer, Sierra Leone, is about to retire from the Colonial Service, which he entered as an Assistant Colonial Surgeon of the Gold Coast Colony in the year 1891. Dr. Forde has had a wide experience of the West Coast of Africa. He was on special service with the Anglo-French Boundary Commission in the year 1892, and served as Medical Officer of the Special Mission to Kumasi during 1894-5. In the latter year he proceeded to the Gambia as Colonial Surgeon, and was promoted Principal Medical Officer of Sierra Leone in the year 1907. He received the thanks of the Secretary of State for the Colonies for his researches into human trypanosomiasis.

THE SOCIETY OF TROPICAL MEDICINE AND HYGIENE.

At a meeting of the Society of Tropical Medicine and Hygiene, held at 11, Chandos Street, Cavendish Square, London, W., on Friday, November 21, 1913, at 8.30 p.m., the following candidates were elected Fellows: Catherine E. Anderson, M.B., Colombo; Richard F. La Brooy, L.R.C.P.Edin., Ceylon; Michael Elmassian, M.D., Paris; Haldane C. Gilmour, L.R.C.S. and P., London; Victor Godinho, M.D., San Paulo, Brazil; S. T. Gunasekara, M.R.C.S., Ceylon; George Hay, L.R.C.P. and S., Ceylon; L. Fabian Hirst, M.D., Colombo; Alexander J. Mackenzie, M.B., S. Rhodesia; H. S. McCulloch, M.B., London; Professor Erich Martini, M.D., Wilhelmshaven; Lieut-Col. Oliver L. Robinson, M.R.C.S., R.A.M.C.; George W. Van Twest, L.R.C.P. and S., Ceylon; Lieut.-Col. E. Wilkinson, F.R.C.S., I.M.S., Caversham.

Reviews.

Practical Bacteriology, Blood Work and Animal Parasitology, including Bacteriological Keys, Zoological Tables, and Explanatory Clinical Notes. By E. R. Stitt, A.B., Ph.G., M.D. Third Edition. Revised and enlarged with 4 plates and 106 other illustrations containing 513 figures. London: H. K. Lewis, 136, Gower Street, W.C. 1913.

The appearance of a third edition so soon after that of the second indicates clearly the value of this little work. The present edition brings the subject up to date, but the material that has had to be added has been so considerable that, even by the use of a smaller type for many of the paragraphs and by increasing the number of lines on each page, the total increase in the book works out at 65 pages more than that of the second edition. In the revision of the chapter on Protozoa the author is greatly indebted to Minchin's recent work on the Protozoa and in those relating to Arachnoids and Insects to the very practical volume of Colonel Alcock, entitled "Entomology for Medical Officers." The illustrations have been added to, and many, which did not seem to bring out sufficiently details of anatomy, have been replaced by others more satisfactory in that respect. The book, as already stated in previous reviews, can be thoroughly recommended to all students of tropical medicine.

Compendium of the Pharmacopœias and Formularies (Official and Unofficial), with Practical Aids to Prescribing and Dispensing. By C. J. S. Thompson. Fourth Edition. London: John Bale, Sons and Danielsson, Ltd., 83, Great Titchfield Street, W.

The compendium has now reached its fourth edition. It will be found most useful for those prescribing and dispensing their own medicine. It forms a handy pocket-book for medical practitioners, pharmacists and students, and should be in the hands of all.

Synopsis of Midwifery. By Aleck W. Bourne, B.A., M.B., B.C.Camb., F.R.C.S.Eng. Bristol: John Wright and Sons, Ltd. London: Simpkin, Marshall, Hamilton, Kent and Co., Ltd. Toronto: The Macmillan Co. of Canada, Ltd. 1913.

A useful little work, the objects of which are explained in the preface. The author there states that he has written his handbook in order to set the principal points of obstetrics before students preparing for qualifying midwifery examinations in a simple and concise manner.

The book serves as a useful supplement to, and not as a substitute for, the ordinary text-books. For men preparing for examinations it will be found most useful as a means of rapidly revising the subject as a whole.

It should serve also as a *vade mecum* for men abroad who may not have the chance of consulting the ordinary text-books, and who may wish at times to refer to different points in the subject.

Sciatica. By Dr. Wm. Bruce, LL.D. London: Baillière, Tindall and Cox. 1913. Pp. 175. Price 5s. net.

Those who are not already acquainted with Dr. Bruce's "theory" of sciatica would do well to read his book on the subject. It is the only attempt we have in all our literature to remove from this tiresome complaint the shroud of ignorance which has cloaked its cause and tended to place its treatment in the hands of unqualified curers of any or all diseases. Dr. Bruce draws attention to the part played in sciatica by hip-joint ailments, and the

writer can confirm all Dr. Bruce maintains as to the relationship.

PREVENTIVE MEDICINE AND HYGIENE. By Milton J. Rosenau, Professor of Preventive Medicine and Hygiene, Harvard, &c. With chapters upon "Sewage and Garbage," by George C. Whipple, Professor of Sanitary Engineering, Harvard. "Vital Statistics," by Cressy L. Wilbur. "The Prevention of Mental Diseases," by Thomas W. Salmon. New York and London: D. Appleton and Company. 1913.

This work is a very valuable contribution to the subject of modern hygiene and sanitation. It will be found of the greatest use by students of tropical medicine and sanitation, as well as by those working at home, because it deals fully and accurately with the prevention of diseases, such as cholera, dysentery, ankylostomiasis, insect-borne diseases, undulant fever, leprosy, kala-azar, &c. Descriptions are also given of fleas, rats, ticks, lice, bed-bugs, and other noxious insects. The second section of the work deals with immunity, heredity, and eugenics, the third section with foods, the fourth with air, the fifth with soil, the sixth with water, and the others with sewage disposal, vital statistics, and disinfection.

The book is well printed, is handsomely illustrated, and should form a useful text-book and book of reference.

MALARIA: ETIOLOGY, PATHOLOGY, DIAGNOSIS, PROPHYLAXIS AND TREATMENT. By Graham E. Henson, M.D., United States Army (Non-active List), with an introduction by Charles C. Bass, M.D., Professor of Experimental Medicine, Tulane University. Twenty-seven illustrations. London: Henry Kimpton, 263, High Holborn, W.C. Glasgow: Alexander Stenhouse, 40 and 42, University Avenue. 1913.

There is not much room at the present day for further books on the subject of malaria, but nevertheless this little work on malaria by Henson will be found useful. The subject is dealt with in nine chapters, as follows: Chapter I, General Considerations; II, Etiology: The Malarial Parasite; III, Etiology: The Malaria-carrying Mosquitoes; IV, Etiology: Other Factors; V, Pathology, Complications, Sequelæ, Prognosis; VI, Diagnosis; VII, Latency, Recurrences, Chronicity; VIII, Prophylaxis; IX, Treatment.

CLINICAL SURGICAL DIAGNOSIS FOR STUDENTS AND PRACTITIONERS. By F. de Quervain, Professor of Surgery, University of Basle. With 510 illustrations and 4 plates. Translated from the Fourth Edition by J. Snowman, M.D. London: John Bale, Sons and Danielsson, Ltd., 83, Great Titchfield Street, W. 1913.

This is an English translation of the fourth edition of Quervain's well-known work, Dr. Snowman being responsible for the translation. The book represents specially Professor Quervain's own experiences, and the illustrations are, with few exceptions, derived from his own observations. The work is divided into six parts. Part I—Surgical Diseases of the Head. Part II—Surgical Diseases of the Neck. Part III—Surgical Diseases of the Thorax. Part IV—Surgical Diseases of the Abdominal and Pelvic Viscera. Part V—Surgical Diseases of the Pelvis and Spinal Column. Part VI—Surgical Diseases of the Extremities. The work is splendidly illustrated, and is undoubtedly a valuable one. Now being translated into English, it should be available to a much larger class of workers than previously. Those interested in surgery may with advantage consult its pages.

A USEFUL little booklet has just been received from Messrs. Wm. Dawson and Sons, of Bream's Buildings. This edition for 1914, consisting of more than 120 pp., contains a list of all the principal British publications with subscription rates for Great Britain, the Colonies, and abroad. In addition it also gives a large number of American and foreign newspapers, and the charges for same, with a mass of other information. This list will be found invaluable for reference to residents abroad.

Personal Notes.

INDIA OFFICE.

From August 4 to November 1.

Arrivals Reported in London. — Lieutenant-Colonel J. Davison, D.S.O., I.M.S.; Lieutenant-Colonel B. E. M. Gurdon, C.I.E., D.S.O.; Major W. N. Hay, 129th Bal.; Captain H. C. Nicolay, 2nd G.R.; Captain E. H. Stocker, 13th Hussars; Lieutenant-Colonel E. V. Hugo, I.M.S.; Captain P. S. Mills, I.M.S.; Captain J. G. B. Shand, I.M.S.; Major A. Murphy, I.M.S.; Major C. H. Watson, I.M.S.; Major H. M. Mackenzie, I.M.S.; Major N. P. O'G. Lalor, I.M.S.; Major C. G. Webster, I.M.S.; Captain W. A. Justice, I.M.S.; Captain A. G. Coullie, I.M.S.; Captain A. E. Grisewood, I.M.S.; Captain F. E. Wilson, I.M.S.; Lieutenant-Colonel R. K. Mitter, I.M.S.; Captain H. R. Dutton, I.M.S.; Colonel R. N. Campbell, C.B., C.I.E., I.M.S.; Major C. R. Bakhle, I.M.S.; Major R. W. Knox, I.M.S.; Captain H. M. H. Melhuish, I.M.S.; Major F. D. S. Fayrer, I.M.S.; Major E. J. Morgan, I.M.S.; Captain W. D. H. Stevenson, I.M.S.; Lieutenant-Colonel E. V. Hugo, I.M.S.; Colonel R. N. Campbell, I.M.S.

Extensions of Leave.—Major J. H. McDonald, I.M.S., 6 m., M.C.; Captain H. H. Broome, I.M.S., 12 d.; Major W. G. Hamilton, I.M.S., 20 d.; Lieutenant-Colonel C. Duer, I.M.S., 27 d.; Lieutenant-Colonel R. H. Caster, I.M.S., 6 m., M.C.; Lieutenant-Colonel W. Molesworth, I.M.S., 3 m. 17 d.; Major G. Y. C. Hunter, I.M.S., 6 m., M.C.; Major W. G. Liston, I.M.S., 3 w.; Captain J. L. Lunham, I.M.S., 9 m.; Captain R. D. Willcocks, I.M.S., 6 m.; Captain R. L. Gamlen, I.M.S., to November 23, 1913; Captain C. H. Barber, I.M.S., 8 m.; Major S. R. Christophers, I.M.S., 2 d.; Major E. A. C. Matthews, I.M.S., to December 4, 1913; Major T. Hunter, I.M.S., 10 d.; Major W. D. A. Keys, I.M.S., 2 m., M.C.; Captain L. Reynolds, I.M.S., 10 d.; Lieutenant-Colonel S. H. Henderson, I.M.S., 3 m.; Major A. A. Gibbs, I.M.S., to April 30, 1914; Captain R. F. Hebbert, I.M.S., 2 m.; Lieutenant-Colonel J. Penny, I.M.S., 4 m., M.C.; Captain G. L. C. Little, I.M.S., 4 m., M.C.; Captain J. G. B. Shand, I.M.S., 2 m.; Lieutenant-Colonel C. Duer, I.M.S., 5 m. 3 d.; Lieutenant-Colonel J. T. Calvert, I.M.S., 6 d.; Major W. E. Scott-Moncrieff, I.M.S., 8 m. 2 d.; Captain R. F. Hebbert, I.M.S., 2 m.

Permitted to Return.—Major W. G. Richards, I.M.S.; Mr. H. Maloney; Mr. E. L. Moysey, I.C.S.; Rev. W. E. C. Henry; Mr. S. E. J. Flanagan; Captain W. H. Riddell, I.M.S.; Major E. L. Ward, I.M.S.; Lieutenant-Colonel R. Bird, M.V.O., C.I.E., I.M.S.; Major F. T. Thompson, I.M.S.

LIST OF INDIAN CIVIL OFFICERS ON LEAVE (INCLUDING MILITARY OFFICERS UNDER CIVIL RULES).

Showing the Name, Province, and Department, and the Period for, and Date from, which the Leave was granted.

Bakhale, Major C. R., I.M.S., Bo., 18 m., July 10, 1913.
Barnardo, Captain F. A. F., I.M.S., B., 30 m. 3 d., May 29, 1912.
Campbell, Colonel R. N., I.M.S., Assam, 8 m., August 2, 1913.
Dutton, Captain H. R., I.M.S., Delhi.
Gibson, Dr. F. M., I.M.S., Director, King Institute of Preventive Medicine, M., 6 m. 8 d., August 21, 1913.
Gray, Lieutenant-Colonel W. H., I.M.S., U.P., 24 m., October, 24, 1911.
Grisewood, Captain A. E., I.M.S., Cent. Prov., 8 m., March 14, 1913.
Hugo, Lieutenant-Colonel E. V., I.M.S., Punj., 14 m. 26 d., July 15, 1913.
Ingram, Captain A. C., I.M.S., M. Med. College, 20 m., June 30, 1913.
Justice, Captain W. A., I.M.S., M. Sanitary Comm.
Knox, Major R. W., I.M.S.
Lalor, Major N. P. O'G., I.M.S., Burma Sanitary Comm., 24 m., July 23, 1913.
Lindesay, Major V. E. H., I.M.S., Behar and Orissa, 10 m., April 8, 1913.
Lloyd, Captain R. E., I.M.S., B., 24 m., November 16, 1911.
Lunham, Captain J. L., I.M.S., Bo., 9 m., March 20, 1913.
McConaghy, Captain C. B., I.M.S., India Foreign, Persian Gulf, 24 m., April 4, 1913.
McDonald, Major J. H., I.M.S., Bo., 12 m., Mar. 19, 1913.
Melhuish, Captain H. M. H., I.M.S., 6 m., September 10, 1913.
Mitter, Lieutenant-Colonel R. K., I.M.S., M., 13 m. 15 d., August 6, 1913.
O'Keeffe, Captain D. S. A., I.M.S., M.
Penny, Lieutenant-Colonel J., I.M.S., Burma, 12 m., December 25, 1912.
Reaney, Captain M. F., I.M.S., C.P., 21 m., July 4, 1913.
Scroggie, Captain W. R. J., I.M.S., 24 m. 14 d., May 14, 1913.
Webster, Major C. G., I.M.S., M. Hospitals, 24 m., July 29, 1913.
Wilson, Captain F. E., I.M.S., India Foreign, 2 m., May 6, 1913.
Woolley, Major J. M., I.M.S., Port Blair, 8 m., March 30, 1913.

LIST OF INDIAN MILITARY OFFICERS ON LEAVE.

Showing the Name, Regiment, or Department, and the Period for which the Leave was granted.

Barber, Captain C. H., I.M.S., to September 4, 1914.
Campbell, Colonel R. N., C.B., C.I.E., I.M.S., to April 1, 1914.
Conway Poole, Captain I. M., S. and T. Corps, to November 11, 1913.
Coullie, Captain A. G., I.M.S., 1 y., to August 3, 1914.
Crimmin, Lieutenant-Colonel J., V.C., I.M.S., to November 30, 1913.
Davidson, Lieutenant-Colonel J., D.S.O., I.M.S., to July 7, 1914.
Dawes, Major C. D., I.M.S., to December 24, 1913.
Fox, Lieutenant E. C. R., I.S.M.D.
Gibbs, Major A. A., I.M.S., to April 30, 1914.
Hebbert, Captain R. F., I.M.S., to December 19, 1913.
Ker, Lieutenant-Colonel M. A., I.M.S., to March 19, 1914.
Kerans, Captain G. C. L., I.M.S., 1 y., to October 4, 1913.
Mackenzie, Major H. M., I.M.S., to October 31, 1914.
Matthews, Major E. A. C., I.M.S., to December 4, 1913.
McVean, Captain N. N. G. C., I.M.S., to February 11, 1914.
Middleton-West, Captain S. H., I M.S., to December 10, 1913.
Murphy, Major A., I.M.S., to March 18, 1914.

COLONIAL CIVIL SERVICES.

Dr. W. S. McGowan has been appointed Medical Officer in charge of the Native Dispensary and Hospital at Belingee, Southern Rhodesia, in place of Dr. Neville S. Williams, who has resigned the appointment.

Mr. R. F. de Boissiere, District Medical Officer of Fiji, has been granted an extension of leave of absence for three and a half months from November 22.

Dr. H. North, who was recently appointed a Medical Officer of Southern Nigeria, has assumed the duties of his office.

Dr. C. R. M. Pattison has been appointed a Stipendiary Magistrate of Fiji.

Dr. P. H. MacDonald, Medical Officer in the Southern Nigerian Service, has retired.

Dr. J. P. B. Snell has left for Southern Nigeria.

Dr. M. C. Blair left recently for Nigeria.

Dr. E. H. Tweedy, Senior Medical Officer, has returned to the Gold Coast.

Dr. Victor T. W. Eagles has been appointed Medical Officer, Grade 3, Federated Malay States, and has taken up his duties.

Dr. J. A. Harley, Medical Officer, Medical Department of the Colony of the Gambia, has left the Colony on leave of absence.

Dr. F. C. V. Thompson has been appointed as an Officer of the West African Medical Staff.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"Bulletin of Entomological Research," vol. iv, part 2, September, 1913.

The following original articles appear in the above number: "A Bug attacking *Sesamum indicum*, L.," by W. L. Distant; "The Bionomics of *Glossina*" (a review with hypothetical conclusions), by William F. Fiske; "On Three New Species of Gamasid Mites found on Rats," by Stanley Hirst; "A New Froghopper from Tobago," by J. C. Kershaw; "Notes on a few Photographs illustrating the Haunts and Habits of *Glossina tachinoides* in Bornu, N. Nigeria," by Dr. Bernard Moiser; "The *Anopheles* of Malaya.—Part I," by A. T. Stanton; "The *Myzorhynchus* Group of Anopheline Mosquitos in Malaya," by C. Strickland; "Progress in the Study of Verruga Transmission by Bloodsuckers," by Charles H. T. Townsend; "On the Chemotropism of Insects and its Significance for Economic Entomology," by Dr. Ivar Trägårdh.

Notices to Correspondents.

1.—Manuscripts if not accepted will be returned.

2.—As our contributors are for the most part resident abroad, proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Original Communications.

PYOSIS TROPICA IN THE ANGLO-EGYPTIAN SUDAN.

By ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H.
Director, Wellcome Tropical Research Laboratories,

AND

Captain W. R. O'FARRELL, R.A.M.C.
Protozoologist, Wellcome Tropical Research Laboratories, Khartoum.

Introductory.—Staphylococcal infections of the skin have been recognized since 1880, when Pasteur isolated staphylococci from a boil. Since then the labours of Garré, Bockhart, Zackermann, Bousquet, Leloir, Unna, Welch, Morris, Macleod, Colcott-Fox and many others have thoroughly established the staphylococcal nature of many skin lesions in temperate climates. The result of this work is that these infections are classified into those of external origin and those of internal origin. The latter are skin lesions due to a blood infection. The former may be subdivided into those of primary and those of secondary origin. Those of secondary origin are the staphylococcal contaminations of primary lesions due to some other cause, such, for example, as scabies.

The primary staphylococcal infections of external origin are usually either follicular or perifollicular inflammations, being connected with the hair follicles, *e.g.*, follicular impetigo, furunculi, carbunculi, sycosis menti, sycosis nuchæ, dermatitis papillaris capilliti, or form abscesses in the dermis, the hypodermis or the subcutaneous tissues, *e.g.*, infantile multiple abscesses, or give rise to inflammations of the folds of the nails, causing onychia, and spreading deeper may enter the tendon sheaths, thus causing whitlows. None of these descriptions, however, apply to a non-follicular staphylococcal skin disease, which is very common in natives and Europeans in the tropical countries in which we have worked, and which was first differentiated by Castellani under the term "Pyosis tropica." As we have quite recently seen the disease in a European and a native in Khartoum, we venture to bring forward the following remarks:—

Historical.—As long ago as 1904 Castellani differentiated the above-mentioned non-follicular pyogenic skin lesion under the term "Pyosis tropica" in contradistinction to the other very common non-follicular pyogenic skin affection often called Manson's pemphigus, but more scientifically named "Pyosis Mansoni" by Castellani.

"Pyosis tropica" is so common in the Kurunegala district of Ceylon that it impressed its presence upon the popular mind and received the appellation Kurunegala ulcers. Castellani found it to be very common, not merely in Ceylon, but also in Southern India, and his publications on this subject may be found in the Ceylon medical reports from 1904 to 1912, and in the first and second editions of a "Manual of Tropical Medicine" by himself and one of us.

In 1912 Gabbi and Sabella record the diagnosis of seven cases of Pyosis tropica in Tripoli.

So far as the literature at our disposal indicates, the above comprise the total original articles on the subject.

Geographical Distribution.—At present "Pyosis tropica" is, as far as we know, only definitely recognized in Asia and Africa. In the former continent it occurs in Southern India and Ceylon, and in the latter in Tripoli and the Anglo-Egyptian Sudan. We are, however, in entire agreement with Castellani's views that it will be found in many other tropical countries if looked for.

Racial Distribution.—As far as we know, the disease has only been reported in Europeans, Tamils, Singalese, and in the so-called Arab peoples of Tripolitana.

Body Distribution.—The eruption occurs most commonly on the legs, next on the arms and, but rarely, over the body.

Etiology.—The causal organism is a micrococcus measuring from about 0·35 to 0·7 microns in diameter and often grouped in staphylococcal masses.

This micrococcus is non-motile, Gram-positive, colours readily with all the ordinary dyes, and does not possess a capsule.

It grows aerobically at 37° C., and in so doing produces a golden-yellow pigment on agar slopes in forty-eight hours.

It produces acid, but no gas, in the following media: *Sugar-peptone media*—(*a*) Monosaccharides: glucose, lævulose and galactose; (*b*) disaccharides: maltose, lactose and saccharose.

It produces neither acid nor gas in the following media: *Sugar-peptone media*—(*a*) Monosaccharides: arabinose; (*b*) trisaccharides: raffinose; (*c*) polysaccharides: dextrin and inulin. *Glucoside-peptone media*—Amygdalin. *Alcohol-peptone media*—Erythrite, adonite, dulcite, isodulcite, mannite, sorbite and inosite.

In broth and peptone-water it produces a turbidity but no indol. In peptone neutral red, when grown aerobically, it produces no fluorescence.

On blood serum it forms small pin-point glistening colonies, but it causes no liquefaction.

Systemic Position.—From the above cultural characters it will be seen that it belongs to the family Coccaceæ Zopf, emended Migula, and to the genus Micrococcus, Hallier, 1866, emended Cohn, 1872.

In this genus it must be classified with those forms which are Gram positive, which grow on agar and which form orange-yellow colonies. These facts, together with its pathogenicity, mark it as belonging to the species *Micrococcus pyogenes* variety *aureus*. Rosenbach, 1884, which is the same organism as *Aurococcus mollis*, Winslow and Rogers, 1908.

It is, however, highly unsatisfactory to leave the classification at this point, for various reasons, *e.g.*:—

(1) The Pyosis tropica organism does not ferment mannite.

(2) The Pyosis tropica organism does ferment lævulose and galactose.

(3) The Pyosis tropica organism can be readily cured by an autogenous vaccine.

(4) Nile boils and allied suppurations in Khartoum also yield organisms of the *M. pyogenes* variety *aureus* type, differing slightly in cultural respects from the organism of Pyosis tropica and from one another, and differing markedly in that a vaccine prepared from a case of Pyosis tropica did not have any beneficial effect upon a case of Nile boils.

With regard to the fermentation of mannite, this is one of the substances recommended by Gordon in 1905 as being of value in the differentiation of the so-called staphylococci. Since then the action of *M. pyogenes* variety *aureus* upon this medium has been ably studied by Dudgeon in 1908, who found that it was acidified by most strains obtained from pathogenic sources. Thus in suppurative cutaneous and subcutaneous lesions he found it absent only twice in sixteen cases and present in all suppurative bone lesions. In cultures from normal skin it was absent once in six isolations. This test would therefore appear to be of some value in the differentiation of closely allied cocci.

Lævulose and galactose do not appear to have been tested by Dudgeon, but they are probably not of the same differential value as mannite, because they are fermented by strains from Nile boils and allied suppurations.

Dextrine was not fermented by the organism of Pyosis tropica, but it was fermented by a subcutaneous suppuration strain of *M. pyogenes* variety *aureus*, but not by one from some Nile boils.

From the above it is quite certain that in Pyosis tropica we are not dealing with the classical *M. pyogenes* variety *aureus*, but with another though closely allied form.

The next point for discussion is whether the Pyosis tropica organism is the same as the organism named *M. pemphigicontagiosi*, Clegg and Wherry, 1906, and which they seem to have proved to be the cause of "Pyosis Mansoni."

This organism resembled *M. pyogenes* variety *aureus* very closely, but differed in that it did not produce indol and that a single human inoculation experiment produced the typical but abortive vesicles of Pyosis Mansoni. It often showed a typical diplococcal appearance and seems to have been closely related to *M. pemphigineonatorum*, Almquist, 1891, differing therefrom by not producing in human inoculations the typical blisters of pemphigus contagiosus.

The Pyosis tropica organism differs from the above, among other points, in the nature of the skin lesions to which it gives rise.

Taking the above points into consideration, we are of the opinion that the organism which we have grown from Pyosis tropica, though closely allied to the classical *M. pyogenes* variety *aureus*, Rosenbach, 1884, is slightly different therefrom, and would therefore suggest the name *M. pyogenes* variety *tropicus*, Chalmers and O'Farrell, 1913, in order to draw attention to the cultural and pathogenic differences. If the genus *Aurococcus*, Winslow and Rogers, becomes established, and it has been supported recently by Kligler, the name of the pyosis organism would be *Aurococcus tropicus*.

Method of Infection.—We are inclined to believe that infection takes place after some slight local traumatism, especially those caused by thorns, or after any other condition which lowers the local vitality, such as an attack of prickly heat.

Symptomatology.—The eruption appears first as small, reddish, scarcely elevated papules, which rapidly become papulo-vesicles and pustules (fig. 1), which are usually encircled by a zone of hyperæmia. These primary lesions are situate between the hair follicles, with which they have no relationship, nor have we noticed any connection with the sweat glands.

Small pustules coalesce together and bursting give rise to a serous exudate which, if allowed to dry *in situ*, forms the yellow crusts, which are highly characteristic in appearance. On removal of a crust an irregular superficial ulcer is laid bare, with a red granulating surface, a free base, and edges which are not undermined. In natives the ulcers are surrounded by a zone of hyperpigmentation, and in Europeans by a hyperæmic area. When the ulcers heal they usually leave spots of hyperpigmentation (fig. 3), but otherwise the affected skin in our cases returned to normal (fig. 2). There is considerable pruritus in all cases.

Castellani's infections were severer than ours and he noticed small flattened or hemispheric nodules under the crusts in addition to the ulcers, and he also observed depigmentation on healing and in chronic cases hyperkeratosis, especially about the elbows, which we have not observed.

As already stated, the regions of the body most commonly attacked are the legs and arms.

Diagnosis.—The essential features of Pyosis tropica are the presence of small pustules placed between the hair follicles and quite unassociated therewith. From these pustules *M. pyogenes* variety *tropicus*, Chalmers and O'Farrell, 1913, can be cultivated.

The differential diagnosis of Pyosis tropica must be made from the various follicular inflammations from Pyosis Mansoni, from Pyosis palmaris, and from Framboesia tropica.

From the follicular pyoses it can be differentiated by observing that the initial lesions have no connection whatever with the hair follicles.

From Pyosis Mansoni it may be differentiated by the absence of the relatively large blebs of this affection, which, though small at first, soon reach the size of a small pea, and may be even larger. Small vesicles are, of course, present in Pyosis tropica, but these rapidly turn into pustules. It may also be distinguished by the fact that the axillæ and groins are not specially attacked.

From the rare "Pyosis palmaris" it may be differentiated by the fact that it never attacks the palms, that the pustules are surrounded by a zone of hyperæmia, and that they do coalesce and form crusts.

From Framboesia tropica it is easily distinguished by the fact that the essential lesion is a small

pustule, and that on removing the yellow crusts, which may cause Pyosis tropica to resemble yaws, the resulting ulcer is quite superficial instead of being raised and of the typical raspberry appearance. The removal of a little serum from a puncture of the ulcer and the examination of the same by dark ground illumination will fail to demonstrate *Treponema pertenue* (Castellani, 1905) which is usually easily found in the typical yaws sore.

Prognosis.—The prognosis is very good if actively treated by means of local and vaccine therapy.

Treatment.—The treatment we have pursued is quite simple. Remove the crusts by means of warm boracic fomentations, then cleanse the sores by a lotion of 1 in 1,000 perchloride of mercury, and apply a 1 per cent. carbolic ointment, and dress the sores twice daily.

In the meanwhile an autogenous vaccine is prepared, and 250 million cocci administered every third day, and controlled by the opsonic index when necessary. We have found an autogenous vaccine to be infinitely better than a stock vaccine, and the same remark holds good for the other allied pyogenic infections, such as Nile boils.

Prophylaxis.—Very little can be said with regard to the prophylaxis beyond general platitudes as to the necessity for care of the general health, regular washing of skin and clothing, and care of the local skin after a slight injury, such as a blow or a scratch.

Acknowledgment.—We acknowledge most gratefully the valuable help which Major Forrest, R.A.M.C., has given us in this and other researches into skin diseases in Khartoum.

LITERATURE.

In chronological sequence.

CASTELLANI (1904-1912). Ceylon Medical Reports.
CLEGG and WHERRY (1906). *Journal of Infectious Diseases*, vol. iii, No. 1, pp. 165-171.
DUDGEON (1908). *Journal of Pathology and Bacteriology*, vol. xii, p. 242.
CASTELLANI and CHALMERS (1910). "Manual of Tropical Medicine," 1st edition, p. 1,069.
GABBI and SABELLA (1912). "Malaria," Settembre-Ottobre, p. 271.
CASTELLANI and CHALMERS (1913). "Manual of Tropical Medicine," 2nd ed., p. 1,463.
KLIGLER (1913). *Journal of Infectious Diseases*, vol. xii, No. 3, p. 432.

THE VAGRANT HABITS OF ASCARIS LUMBRICOIDES WITH THE REPORT OF A CASE OF INTEREST.

By T. S. TIRUMURTI, M.B., C.M.
Assistant Professor of Pathology, Medical College, Madras.

IT is well known that intestinal worms are very common in the Tropics, the worms usually met with being *Ascaris lumbricoides* (round worms), *Trichocephalus dispar* (whip-worms), *Oxyuris vermicularis* (thread-worms), *Ankylostoma duodenale* and *Necator americanus* (hook-worms). Verminous infections are so common in India that a knowledge of these worms and their ova is absolutely essential to the medical practitioner. The statistics collected by me in the general hospital *post-mortem* room show that over 50 per cent. of the patients who died of other diseases harboured round worms. Fortunately, the round worms cause no serious trouble in most persons. Usually their numbers vary from half a dozen to a dozen. Rarely patients harbour large numbers of them and yet suffer from no symptoms, but they give rise in many instances to colic, nausea, vomiting, dyspepsia, and occasionally severe diarrhœa, especially in children. In the Madras Medical College Museum is a specimen of a collection of 357 round worms said to have been passed in three days by a native girl aged 12. The patient was admitted to hospital for severe colic. Two grains of santonine, both morning and evening, followed by castor oil, caused the expulsion of the worms. The girl left hospital cured in a week.

Cases are recorded by Cobbold where the ascaris is said to have given rise to cerebral symptoms, convulsions, epilepsy, and cataleptic fits. Many cases of convulsions in children are attributed to the presence of these worms in the intestines. A tangled mass of round worms may also cause intestinal obstruction. In the third physician's wards, General Hospital, Madras, Captain Ingram, I.M.S., mentions that one of the four patients suffering from symptoms due to the presence of round worms under treatment passed ninety-nine round worms within three days, eighty-two of them in one large stool after an enema. The symptoms of the patient were constipation, vomiting, and pain in the abdomen, so that the picture presented was suggestive of intestinal obstruction.

The normal habitat of the lumbricus is the jejunum and upper part of the ileum. It often wanders to different parts of the intestinal tract, stomach, mouth and anus, and gives rise to no serious trouble. There are instances in which it has passed into the larynx from the œsophagus, causing asphyxia and death. It is also known to cause diffuse suppurative peritonitis by getting into the abdominal cavity through ulcerated patches of intestine, but the possibility of its perforating the normal alimentary canal is doubted, as, fortunately, it is not provided with any kind of boring apparatus. The large number of cases mentioned in the literature are probably to be explained by the supposition that the round worms play only a secondary part, since they have been observed, after the death of the host, to make use in their movements of passages caused by ulcers perforating the intestine. To corroborate this hypothesis the character of the perforations has been cited, which looks more like a gradual erosion than the result of a mechanical force. Leuckart writes, "Although it is difficult to decide the question with certainty, I think that the denial of the presence of these perforations is unfounded. That a boring apparatus is by no means necessary for the perforation of tissues

and organs has been decided by modern investigations, and is indeed sufficiently proved by the instances which we have collected of wandering cysticerci."

Cases are recorded in which the ascarides get into abscesses in communication with the intestinal tract. Curiously enough no such communication was seen in the following case recorded by Major Niblock, I.M.S., 1st Surgeon, General Hospital, Madras (1910), of a Hindu girl, aged 12, who was admitted suffering from an abscess in the right ileo-lumbar region. As soon as the abscess was opened two large round worms wriggled out of the wound. There was nothing to point to intestinal trouble, nor was there any smell indicating *Bacillus coli* infection. The abscess healed up without any trouble.

Liver abscesses have also been known to result from the vagrant habits of the ascarides, though such instances are very rare. Major H. Kirkpatrick, I.M.S., has recorded the case of a young married woman who attempted to commit suicide by throwing herself into the Cooum on account of severe constant pain in the pit of the stomach, of which she complained for ten months previously, except when she had occasional intermissions from the pain. She had irregular remittent fever and extreme tenderness in the epigastrium to the right of the middle line. At the operation a living round worm 11 in. long was withdrawn from an abscess in the right lobe of the liver. The lay mind of the hospital ayahs magnified the worm to a snake, which the patient was thought to have swallowed in her temporary abode in the Cooum.

Sometimes the lumbricus gets through small orifices in communication with the alimentary canal, as into the appendix, giving rise to appendicitis, or through the ampulla of Vater into the common bile-duct and gall-bladder. These instances are, however, distinctly rare. Cobbold mentions that the third fasciculus of a work illustrating the collection of morbid anatomy in the Army Medical Museum at Chatham gives a case of lumbrici occupying the biliary ducts and gall-bladder. I can meet with no case in the literature, however, in which numbers of them had travelled into the liver along the hepatic ducts giving rise to biliary obstruction and formation of biliary calculi in the liver. Hence the report of the following case will prove interesting:—

The patient was a Hindu girl, aged 12. She was admitted into hospital suffering from fever. On examination the spleen was found enlarged, and signs of pneumonic consolidation of the left lung were present. She died the day after admission, and a *post-mortem* examination was conducted by Major H. Kirkpatrick, I.M.S., and myself.

The body was that of a poorly nourished girl. Rigor mortis was present. The skin was highly pigmented. There were cicatrices of ulcers over the thighs and anterior abdominal wall. On opening the abdomen the liver was found enlarged about three fingers' breadth below the costal margin in the nipple line, and five fingers' breadth below the ensiform cartilage. The spleen was much enlarged. The veins in the neck were distended. The heart and the right lung showed no pathological changes. The whole of the lower lobe of the left lung was a solid mass, the pleura over which was inflamed. On section it was found to be of a greyish red colour, with numerous dark red areas of hæmorrhages in its substance. Out of the cut surface a thick yellowish fluid escaped. The cut surface was granular, and the substance friable. The mucous membrane of the smaller bronchi was reddish in colour. The bronchial glands were enlarged, caseous and pigmented.

The spleen was enlarged to about six times its normal size, soft and flabby. The cut surface had a glazed look, and was of a chocolate colour. The substance was moist and friable. The trabecular markings were obscured. The capsule was thickened in places.

The kidneys were larger in size than normal. On section they were moist, congested, and dripped blood. The cortex was normal in extent, and streaked with vessels. The capsule was thin, stripped easily, and left a smooth surface.

The liver was enlarged, and on section of a pinkish grey colour. The veins were full of blood. The consistency was normal. The bile-duct had five round worms distending it. Many lumbrici had travelled up the smaller bile-ducts, one of them to very nearly the dome of the right lobe near the posterior margin. The cut surface of the worms and several soft irregular gall-stones were found in the several sections of the liver. The specimen is preserved in the Madras Medical College Museum.

The microscopical examination of the spleen and bone-marrow smears showed numerous typical *Leishmania-donovani*.

The girl died of kala-azar, in which pneumonia was a terminal manifestation. History of no symptoms referable to the verminous infection of the liver or to the presence of numerous calculi in the hepatic ducts was obtained.

I am of opinion that the lumbrici had not travelled up the hepatic ducts after the death of the patient, but must have done so a long time before death, as their presence had caused some amount of obstruction to the flow of bile, thereby giving rise to the formation of hepatic calculi.

My thanks are due to Major H. Kirkpatrick, I.M.S., for his kindness in allowing me to make use of the notes of the case.

References.

Catalogue of the Madras Medical College Museum. (In print).
Annual Report and Statistics of the Government General Hospital, Madras, for the year 1909; Third Physician's wards.
Annual Report and Statistics of the Government General Hospital, Madras, for the year 1910; First Surgeon's wards.
Annual Report and Statistics of the Government General Hospital, Madras, for the year 1910; Third Physician's wards.
"The Parasites of Man." Rudolf Leuckart.
"Parasites: a Treatise on the Entozoa of Man and Animals." Cobbold.
The Madras Government General Hospital Post-mortem Records for the year 1912. P.M. No. 453.

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THE JOURNAL OF

Tropical Medicine and Hygiene

DECEMBER 15, 1913.

ANTI-TYPHOID INOCULATION.

To those concerned in examining men and women about to proceed to the Tropics the question of anti-typhoid inoculation is an ever-present one. There are several factors which have to be dealt with, all of which need consideration, even to the temporary inconvenience inoculation may cause; and before touching on the main question, namely, the efficacy of the protection afforded, several side issues may be disposed of. Inoculation is usually performed immediately, say, the last fortnight, before the candidate leaves home to go on board ship. This is surely the worst time possible; it is a period of hustle and hurry, saying good-bye to parents and friends, getting ready for the voyage and purchasing an outfit. In the midst of this comes the question of being inoculated, involving, as it often does, keeping quiet for two days out of the fourteen at one's disposal. The candidate, rather than submit to this, foregoes inoculation and starts on his voyage. He may be told that he can be done on board ship, and he is provided with the necessary vaccine, so that he may be done by the doctor on board ship. Not infrequently the doctor has never before given an anti-typhoid injection, and he hesitates to do so, advising his would-be patient to wait until he gets to the port of his destination. On arrival there he is at once launched upon work, and frequently finds that the man he is to "relieve" has already gone home and a burden of heavy office work is laid upon the new-comer, who finds his new surroundings take all his time to become familiar with. The anti-typhoid inoculation is postponed, and as the days grow into weeks and months the inoculation is put off, as there seems nothing wrong with the climate and the new-comer feels, as most new arrivals do, very fit. He may or may not fall a victim to typhoid, but the chances are if he does unfortunately do so it goes hard with him. Another form of neglect is that the candidate may before he leaves home have had only one injection; he declares he felt so stiff and bad after the first that he is not going to have a second, as he is too busy and cannot keep quiet. It is needless to say that this man is imperfectly protected.

These are some of the reasons for a man or woman not being protected before leaving home; frivolous they may seem, but nevertheless none the less difficult to contend with.

Another question often asked by the candidate or the firm he is employed by: "Is it necessary to be inoculated against typhoid before going to ——?" naming some place in the Tropics, the Far East, South Africa, South America, &c. This is a difficult, and at times a troublesome question to answer. Difficult, inasmuch as it is impossible to know the sanitary conditions of every town or district in the world outside these shores, for that is what it amounts to; and troublesome, inasmuch as if it is insisted upon the health authorities in the place named may resent the opinion of the medical man at home, who regards a suggestion, even of inoculation, as a necessity for "——" as an insult to the sanitary condition of the particular town or district of which they are in charge. There are, however, certain towns and districts which are notoriously typhoid stricken, whilst there are others where protection against typhoid is uncalled for. One would like to mention these, but to give a list of the safe and unsafe places would only cause friction, and might terrify unnecessarily intending candidates or their relatives to the extent that a refusal to go abroad might be the consequence. An "unhealthy" place does not signify typhoid infected, but that it is beset by malaria or yellow fever, &c. There are several so-called unhealthy regions where typhoid is practically unknown; perhaps the West Coast of Africa is a typical example, so much so that, rightly or wrongly, the writer does not recommend, or, at any rate, does not insist upon inoculation against typhoid being done in the case of men proceeding to the "Coast." This, however, is not the case in many countries nearer home; the writer recommends all young folk under 21 to be inoculated against typhoid before proceeding to any and every country bordering on the Mediterranean; and in the case of boys and girls proceeding to the continent of Europe to reside in a school, be the country what it may, to be inoculated before going abroad. We are so free of typhoid in Great Britain now that

one is apt to forget that other European countries are not so favourably placed and that the young are particularly susceptible. Typhoid is so rare a disease in London hospitals at present that many a student of two or three years' standing has never seen a case. On the other hand, the following is instructive: A party of medical men, accompanied in some instances by their wives and by five young folk under 21, twenty-three in all, proceeded a few years ago to the Mediterranean to take part in the opening of a large sanatorium, with the result that four of the five under 21 years of age contracted typhoid. There would, however, seem to be some parts of the world where typhoid is unknown, or, at any rate, where it has not been diagnosed; it would be advantageous to know these for many reasons; and it would appear also that there are, within the lifetime of the present generation, regions where typhoid, previously unknown, has appeared and spread and become endemic.

The geographical distribution of typhoid as it stands at present is unknown, and it would be interesting, let alone the practical value ensuing, to find out what the distribution really is. Can any of our readers tell us towns, districts or countries where typhoid is unknown?

The value of anti-typhoid inoculation is generally recognized, although we have not had sufficient experience of the trial to pronounce what the value really amounts to.

We usually allow those who have had typhoid previously to forgo inoculation before going abroad. That this is not always satisfactory is proved by the fact of a civil surgeon who went out to South Africa in 1901, during the war, contracting typhoid there, although only twelve months previously he had an attack of typhoid in London.

The question of different types of the ailment is raised by such cases as these, as if what was protection against an English form of typhoid was not sufficient protection against the South African form, and *vice versâ*. The question also of inoculation with local types of vaccines arises, and although this at present is disregarded, it may not continue to be so.

The main question of the good anti-typhoid inoculation does remains to be dealt with. Is it possible for anyone to pronounce upon this? Have we sufficient statistics to go upon? In the British Army the pronouncement is distinctly in favour of anti-typhoid inoculation, and recently the authorities of the French Army have recommended that anti-typhoid inoculations shall be compulsory. The United States Army authorities have already made inoculation compulsory, and legislation in many other countries is tending in the same direction. The most recent statistics are the French; the proportion of cases of typhoid amongst the inoculated and non-inoculated in France and Eastern Morocco being *per mille* 0 to 38·23 respectively. In Western Morocco, where exposure to infection is greater, there were amongst the inoculated 2·96 cases per 1,000, with 0·09 deaths; against 165·75 per 1,000, with 21·291 deaths amongst the non-inoculated.

There is no doubt, however, that in war prophylactic measures are difficult and in many instances impossible, and that typhoid still remains one of the great scourges of military campaigns in almost every country. It would appear, therefore, that there is sufficient evidence to justify medical men pushing the idea of anti-typhoid inoculation to the full, more especially in the case of young people under, say, 25 years of age, who leave these shores for any country, whether for travel or for prolonged residence.

It is during the first two years, more pronouncedly in typhoid-infected countries, that the danger exists, and it is advisable that inoculation should be carried out, in the case of all young people proceeding abroad, before they leave British shores.

J. C.

Abstracts.

NEURASTHENIA, AND ITS BEARING ON THE DECAY OF NORTHERN PEOPLES IN INDIA.*

By Surgeon-General Sir R. Havelock Charles, G.C.V.O., I.M.S. (R.).

Sergeant-Surgeon to H.M. King George V.; President of the Medical Board, India Office.

The author said it was difficult to dogmatize on such a subject; but he thought it possible to argue from the lessons of history, analogy, and experience.

His work on the India Office Medical Board had brought before him:—

(*a*) The unhealthiness from which Englishmen suffer after a long spell of Indian service. All on sick leave come before the Board, and one can see that debility, mental and physical, apart from any special disease, renders a change to Europe every four or five years a necessity. This is the explanation of Government and Mercantile leave rules. It is not a spirit of philanthropy that is at the base of these regulations, but a desire to have the European servant at his best.

(*b*) The condition of physical fitness of men going to India—as all recruits are passed by the Medical Board.

(*c*) The diseases causing ill-health, death, or invaliding—for the Board inquires into such.

The author said it was not his purpose to consider neurasthenia save as regards its determining factors, and the influence it must exercise on any people transported to countries where this affection is common, and to which disease their conditions of life would render them easier victims.

In opening a discussion on "Special Factors influencing the Suitability of Europeans for Life in the Tropics" at the British Medical Association, London, 1910, he stated his opinion as to the best health capital to be taken to the Tropics, and said that the best kind of man was the good ordinary type of Britisher with a clear head "well screwed on," an even temper, not over intellectual, who can

* A paper read before the Society of Tropical Medicine and Hygiene, October 17, 1913.

FIG. 1.—PYOSIS TROPICA IN A EUROPEAN.

If this illustration is examined with a hand lens the individual pustules will be easily seen.

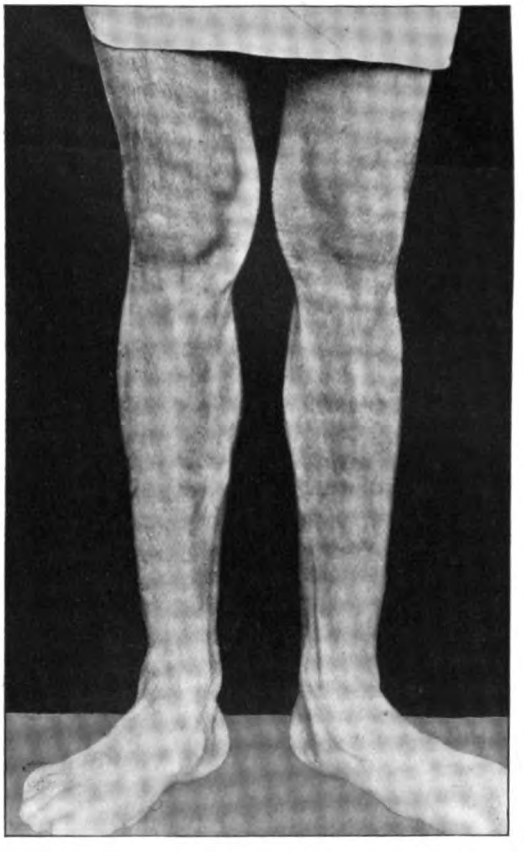

FIG. 2.—SAME CASE AFTER VACCINE AND LOCAL TREATMENT.

This photograph was taken ten days after the first.

FIG. 3.—THE HYPERPIGMENTATION OF THE SKIN AFTER AN ATTACK.

This photograph was taken about two months after the eruption was cured. The hairs on the leg had to be removed in order that the area of hyperpigmentation might show clearly. It may, with advantage, be examined by means of a hand lens.

To illustrate paper on "Pyosis Tropica in the Anglo-Egyptian Sudan," by ALBERT J. CHALMERS, M.D., F.R.C.S., D.P.H., and Captain W. R. O'FARRELL, R.A.M.C.

take an interest in things around, not unduly introspective, one who can work hard and find pleasure in it, capable of bearing exposure to the sun; one who will practise temperance in all things, with self-control and common sense—meaning that such a one inherits no *liability* to that neuropathic disposition which requires only a light exciting cause to develop active mental trouble.

In the Tropics normal persons often experience symptoms which, when more strongly marked, are characterized as neurasthenic, whilst those of weaker mental calibre become unbalanced. In the former case the condition responds more readily to treatment than does the neurasthenia as met with in Europe, but for its cure a change of climate is absolutely essential.

Many years ago, when Sir Havelock Charles began life in India, stationed in the Punjab, he often heard it said of individuals in the various services, "Oh! such and such a one ought to go to Europe for a bit—he has got, or is getting, Punjab head." On inquiry he found the signs of this peculiarity were that an officer, otherwise in every way a good fellow, had become short-tempered; forgetful of names; troubled with sleeplessness; given to feel his work too much for him; disinclined to take responsibility; given to make molehills into mountains; procrastinating; susceptible on slight exertion, mental or physical, to fatigue; and with a loss of all powers of concentration. In fact, an irritable man, more or less unequal to his work, though otherwise fairly fit.

Since that date, during much travel in India and Burma, and twelve years' work in Calcutta, he recognized that those peculiarities were the commencing signs of an affection which had been named neurasthenia.

Amongst Europeans in India it is an affection well worthy of study. It does not directly kill the patient, but it "hampers his work, interferes with his career, ruins his temper, upsets his friends, and causes him to be unfit for any position of trust or responsibility."

The primary causes leading to this in the Tropics are the humidity, and the sun, with its light and heat. Helping these are the parasitic diseases—the causal agents of which owe their vigour to the climate and their preservation to the environment.

An abnormal bodily state is produced by the light, the heat, and the humidity—a change in body temperature, a lowered pulse-rate and tension, an irritable heart, a lessened respiratory function owing to deficiency of intake and rarefaction of the air, and a deterioration of the blood. An increasing perspiration causes a lessening of the kidney excretion; with the extra work thrown on the liver there follows a continued congestion, then degeneration; an atonic dyspepsia and impaired function lead to pathological decomposition of protein bodies in the gastro-intestinal canal, and there ensues chronic auto-intoxication and its results. Thus the climatic conditions lower the powers of resistance, and render the individual more liable to fall a victim to the attacks of the specific forms of disease.

The author has met with the subjects of neurasthenic troubles during twenty-five years in India, and, in the past six years, on the Medical Board, India Office. In the latter time there have been upwards of 150 cases.

The commonest *symptoms* manifested have been:—

Mental.—A lack of confidence, tendency to introspection, loss of energy, want of power of concentration, phobias, insomnia.

Emotional.—Lack of control of feelings, irritability, depression.

Circulatory and Vasomotor.—Palpitation, headache, sense of giddiness, sweating.

Various Forms of Gastro-intestinal Trouble.—Colitis, dysentery, diarrhœa, &c.

Nowhere in the world can be seen a white race, in a tropical climate, maintaining the original energy of the people that founded the power. The damp heat changes the quality of the blood; the muscular fibre becomes less vigorous; the brain becomes more irritable; the calm reason, the temperate will, the foresight, the strength, the skill, the endurance of the European, becomes sadly reduced by the tropical conditions, all acting with their depressing effect on the nervous system.

In India the European is in a position of trust and has much responsibility. His work is harassing in nature and entails much mental effort. In the temperate zone many endure strain and mental expenditure, working early and late, and keep their powers unimpaired; but in the Tropics the powers of resistance to such strain are greatly lowered, and eventually, *in the predisposed*, the nerve breakdown called neurasthenia ensues.

When the normal European goes to India he first experiences a marked feeling of wellness, his brain is more active, and his muscle vigour more marked. He cannot understand either the complaints, or the warnings, of the old residents. He thinks he has an inexhaustible capital of health, but he overdraws, and exhaustion follows. The sleepless night of fervent heat, noisy with insect life, the food tasteless and unrefreshing, the loneliness of the station, the petty worries incidental to the humdrum of the life, the sun shining all day, bring about tiredness of mind and body. It is this terrible nerve exhaustion which has, in the past, been the most important factor in preventing the Northern races settling, and procreating their line, with a full share of the nerve vigour which the parental stock possessed. This is why the invaders of India have disappeared, and this is the bar to the settlement of tropical regions by white folk. It has been written of India that there the European struggles during the first, dwindles and degenerates during the second, and becomes extinct, as such, during the third or fourth generation.

One cause, and one only, can keep the European up to his standard, and that is—frequent change. However you alleviate, by increasing knowledge, the conditions of life, the factors of climate remain —those many and subtle physical agencies so active towards the human organism in health and disease.

The sun and the moisture gradually sap the body, the feelings, the mind. The domiciled become pale and pallid, the prey possibly to anæmia, fever, and dysentery; unequal to labour and unfitted for supervision, wasted and worn, they leave a strain born of a neurotic stock.

Finally the author concluded as follows:—

(1) I start from Cuvier's axiom: "The nervous system is at bottom the whole animal, and the other systems are only to serve it."

(2) My thesis is that the constitution of the Northern races is developed in temperate latitudes —that its powers are vigorously affected by the climatic conditions of the hot zone.

The way in which to establish a theory is to advance definite facts in its favour.

(i) If you damage the subservient systems you injure the whole animal, *i.e.*, the nervous system.

(ii) Tropical climates injure the various systems of the body apart altogether from the dangers of attack from parasitic enemies.

(iii) The characteristics of dwellers in the Tropics are distinctive of them and produced by their environment.

(iv) The characters of the Northern races are a thing apart and due to similar causes.

(v) Brain power, or the civilization due to it, did not arise in the hot zone, for the seats of this ancient civilization—the old "culture zone"—were in lat. 25° N. to 50° N.

(vi) Modern civilization, with higher brain development, has gone still further north than the seat of the "culture zone," and is now found in the temperate regions.

(vii) The emotional type of brain, when found in the Northern peoples, is more peculiar to the races that live in the warmer parts, and they have that in common with dwellers in the sub-Tropics.

(viii) What has happened to the myriads of invaders of India? Have they maintained their power, or have they decayed—Aryan, Greek, Scythian, Hun, Mongol, Parthian, &c.? Do the peoples of India preserve the characteristics of these invaders? Do the descendants of the invaders preserve the powers of the nations from whence they sprung, and are they comparable to the peoples occupying the original homeland?

(ix) What has been the effect on the descendants of the European races that have gone to India in old days—Portuguese, Dutch, French, English? To how many generations does the pure blood survive? What is the character of the degenerated stock?

(x) How do the heads of the great merchant firms in India answer the foregoing question when employing men for various business posts? The Eurasian gets a certain pay; the country born gets double that; the imported European, with his energy and fresh vitality, gets four times the amount given to the Eurasian, and twice that given to the country born.

(xi) The Emperor Baber, in his Memoirs, makes an interesting note on the depressing effect of the climate on his followers—a falling off in energy and initiative. For this he gave them permission to return to the cooler regions to recuperate, whilst he himself battled with the discomfort of the sun and the surroundings.

(xii) There is a disease—diabetes—which has certain relations to the nervous system. That affection is very prevalent in India, and increasingly so since the Indians have been forced to live more strenuously by their contact with Europeans, the strain being less easy to bear there than in Europe.

(xiii) What occurs to the various strains of horses, cattle, sheep, dogs, poultry, and even vegetables, introduced from Europe to the plains of India? Do their distinctive characters remain or deteriorate?

(xiv) Experiment has shown that metabolism in flowers and changes of colour and structure can be brought about by insolation—according to the altitude, seasonal and diurnal.

(xv) What is the meaning of "Punjab head," "Bengal head," "Burmese head," and other such terms? (? Warnings of neurasthenia.)

(xvi) The conditions affecting the foregoing are those that have had to do with the formation of races—climate, food, soil—*i.e.*, environment.

NYASALAND PROTECTORATE: SLEEPING SICKNESS DIARY.

PART XXI.

By H. HEARSEY.
Zomba.

HEARSEY states that during the months of May, June, July and August, 1913, twenty-five additional cases of sleeping sickness have been notified, namely, six in May, three each in June and July, and thirteen in August. Of this number seven have been discovered by Dr. Morgan in the Marimba district, sixteen by Dr. Conran in the Dowa district, and two by Dr. Sanderson in the South Nyasa district. These twenty-five cases added to those previously reported now make a total of 153.

As was stated in the last memorandum, a reinvestigation of the contiguous fly-infested districts, to the north and south of the "Proclaimed Area" in the Dowa district, was to have been taken in hand. Funds available for this purpose have not admitted of an extended search being made for cases, but a period of three months' investigation, however, was allotted to each of the following four districts with results as now indicated:—

Marimba District.—Dr. Morgan, who began his investigations in August, has, as already noted, been successful in finding seven cases within the month. Six of these were discovered in the northern portion of the fly-area, which is here continuous with a similar area extending to the southern portion of the West Nyasa district; one case has quite recently been found in the extreme southern part of the district, where the Marimba and Dowa fly-areas merge into one another.

Dedza District.—The reinvestigation of this district, which began in June and terminated in

August, was entrusted to Dr. Davey. After a most painstaking search no cases were discovered, and, as in the past, failure has again been attributed to the unfavourable attitude of the natives and to an entire lack of co-operation on their part. The distribution of tsetse-fly in this district is in a relatively narrower "belt," which traverses its entire eastern border along, but at some little distance from, the Lake shore. As this fly-area in the north is continuous with the fly-area in the Dowa district, and with a similar area in the South Nyasa district to the south, whence two cases have recently been reported, it may quite reasonably be assumed that the Dedza district also harbours infected cases, however few in number.

South Nyasa District.—Dr. Sanderson began his investigations in this district in August and has succeeded in finding two cases up to the present—both at the south-west arm of the Lake, that is to say, in the north-eastern portion of the district. During the month of September he will devote attention to its southern boundary.

Upper Shire District.—On the completion of his investigations in the South Nyassa district at the end of September Dr. Sanderson will investigate the Upper Shire district during the months of October and November, working down to the extreme southern range of tsetse-fly distribution in the Blantyre and West Shire districts.

It has generally been assumed, Hearsey says, that sleeping sickness is endemic, more or less exclusively, in the Dowa district; the object of these investigations is to demonstrate that the disease is to be met with wherever there is tsetse-fly, and that, therefore, there is no part of the Protectorate where, in the presence of tsetse-flies, opportunities do not exist for contracting infection. In short, an effort is now being made to substitute facts for what has hitherto been conjecture; with a view to inducing people living in, or passing through, fly-areas to appreciate the danger and to adopt necessary precautions. For, however small the danger of infection may be, the fact remains that the disease is invariably fatal within a comparatively short period. Dr. Conran, in his monthly report for August, states in reference to the question of personal prophylaxis: "A gradual alteration in the attitude of the natives towards the fly is noticeable. Missionaries inform me that when travelling in the area ('sleeping sickness') they overhear quite intelligent discussions as to the best way to avoid bites, and I notice that many more natives carry fly-whisks or bundles of leaves when travelling than was the case last year."

Preventive Measures.

The following preventive measures are now being carried out:—

(1) Impressing upon the natives the necessity of avoiding being bitten by flies.

(2) Clearing for a distance of 300 yards or more round villages situated in close proximity to fly. Extending these clearings in many instances so as to embrace their food gardens also.

(3) Making clearings on each side of roads and main paths leading from one village to another, thus uniting groups of villages and enabling the natives to journey from one to another with commensurate safety.

(4) Instructing the natives to use this felled timber for firewood, and to avoid visiting the adjacent fly-infested woods for this purpose.

(5) Instituting public latrines in all the villages, to prevent natives from visiting the adjoining woods for the purpose of defæcation.

(6) Prohibition as to the firing of grass till the month of October, when only it is fit for burning, so as to ensure as large and as effectively cleared areas as possible.

(7) Removal, whenever feasible, of villages situated in danger zones, to fly-free areas.

To expedite clearing operations axes and heavy knives have been supplied to natives in the sleeping sickness area, and during a recent inspection there was reason to be satisfied that some measure of protection at all events will be secured from the bites of tsetse-flies, and the danger of man-to-man infection possibly considerably minimized.

The supervision of these clearing operations has been placed in the hands of the Medical Officer's patrols and police employed in the area, as also the construction and general supervision of the latrines, Dr. Conran making his periodical visits to see that the work is progressing apace and that it is being properly carried out. All this work is being done by the villagers themselves, without payment of any kind; and on inspection the author was satisfied that the various headmen whom he met not only did not regard this labour as an imposition, but appeared to take an intelligent interest in the work.

Treatment.—The question of treatment has recently formed the subject of a special communication, and it has been pointed out that unless natives are segregated in hospital anything in the way of systematic treatment, which alone would be of any value in furnishing reliable data, cannot be taken in hand. Segregation, partly with a view to treatment, has been tried in the Dowa district and found unworkable. It invariably resulted in the concealment of the sick, and natives seemed to be convinced that the sick died, not in spite of, but in consequence of treatment. The object at present is to ascertain the range of distribution of the disease; any attempt, therefore, to segregate the sick, for whatever purpose, would reduce the number of infected cases now found, already few in number, to a minimum.

Various treatments have, in the past been given a trial: (1) Atoxyl alone; (2) atoxyl, with intermediate doses of hydrarg. perchlor.; (3) soamin; (4) salvarsan; (5) tartar emetic; (6) dye B.S. In no case was there recovery, and in one or two instances in which some amelioration of the patient's condition was observed the improvement was merely of a transitory nature. Such slight improvement in symptoms is, however, occasionally noted in patients undergoing no treatment.

Annotations.

Entamœbæ in Monkeys.—C. Mathias, in a paper in the *Bulletin de la Société Médico-Chirurgicale de l'Indochine* (September 14, 1913), describes two interesting entamœbæ which he has encountered in monkeys (*Macacus rhesus* and *M. tchehensis*) of Tonkin. Various observers have recorded, from time to time, such organisms, either in the free condition or encysted, but they have given no details of structure or development. C. Mathis has been able to study two entamœbæ of the monkeys, and these are remarkable in that one of them conforms closely to the *Entamœba coli* of man, producing cystic forms having eight nuclei, while the other resembles *E. histolytica*, the pathogenic form from man, and, like it, produces infective cysts having a maximum of four nuclei. There seems very little, if anything, to distinguish the former from *E. coli*, the non-pathogenic entamœba of man, but regarding it as a distinct species, the author suggests for it the name *Löschia legeri*, adopting the generic name *Löschia* in place of the name *Entamœba*, which was first given to an organism from the intestine of the cockroach, which, according to Chatton and Bonnaire, who created the name *Löschia*, certainly belongs to a genus distinct from the amœboid organisms of the human intestine. Similarly, Mathis names the second of his monkey entamœbæ *Löschia duboscqi*. Here, again, there appears nothing to distinguish this organism from the pathogenic entamœba of man, and the author discusses the possibility of their being the same. However, on account of the difficulties of establishing this point, he thinks it safer to regard them as distinct. It is possible that this is the organism found by Castellani (1908) in pus from an hepatic abscess in a monkey (*Macacus pileatus*), and named by him *Entamœba nuttalli*, but no cystic forms were described, and it is impossible to decide whether this is identical with the *Löschia duboscqi* described by Mathis, and which, moreover, was not associated with any dysenteric condition.

The author also records the culture of amœbæ from the fæces of monkeys on the medium of Musgrave and Clegg. These are always of the *Amœba limax* type, and apparently have nothing to do with the entamœbæ, but are derived from cysts of free living amœbæ which have been ingested with the food.

Entamœbæ of Man.—"The Entamœbæ of Man" is the subject of a paper by Kuenen and Swellengrebel in the *Centralblatt f. Bakteriologie* for November 15, 1913. The observations were made in Medan (Deli-Sumatra), and the authors find that here, as elsewhere, two entamœbæ exist: one, *Entamœba coli*, non-pathogenic and producing eight-nuclear cysts; and the other, *E. tetragena* (*E. histolytica*), pathogenic and producing four-nuclear cysts. They describe in detail the development of the two entamœbæ. *E. coli* varies in diameter from 22 to 38 μ. They have not encountered the much smaller forms which have been described by some observers. The cysted forms of *E. coli* vary in diameter from 16 to 25 μ, which is a measurement considerably above that given by most writers. In the development of the cyst from the uninuclear to the eight-nuclear stage there is described as a normal process of development the formation of a large vacuole, which occupies the greater part of the cyst during the early stages of development, and which disappears as the nuclei multiply. It is certainly true that in many of the cysts of *E. coli* such a large vacuole occurs and it has the effect of displacing the nuclei to the side of the cyst and hindering their division, but it is doubtful if it can be regarded as of normal occurrence. In the normal development no such vacuole is formed, and the nuclear divisions, first into two, then into four and eight, proceed rapidly, so that the early stages in the absence of a vacuole are only of short duration. As regards the development of the pathogenic entamœba (*E. histolytica*), the authors accept the cycle first described clearly by Darling in Panama. There are two distinct types of free forms, one the *histolytica* type, which is the tissue invading form, and is to be found during the acute dysenteric phase. It measures from 25 to 30 μ, has usually a definite ectoplasm, a nucleus of 6 to 7 μ, with a small karyosome surrounded by a clear area limited by a ring of chromatin granules. Within these forms ingested red blood corpuscles are often seen. The second type of free form is seen in patients who have recovered from dysenteric attacks and who have for the time being no indication of intestinal ulceration. These, which were thought by Elmassian to belong to a distinct species (*E. minuta*), have a diameter of 12 to 16 μ. The protoplasm is vacuolated; there is no clear distinction between ecto- and endoplasm; the nucleus measures from 3 to 3·4 μ, and often there is a good deal of chromidium in the protoplasm. The *minuta* forms do not invade the tissues, but live, as saprophytes, in the fæces, as does *E. coli*. In this condition they may be present in the stools for many months without giving rise to any symptoms. It is the *minuta* form which produces the cyst which is responsible for the infection of new individuals. These cysts measure from 11 to 14 μ; they contain one, two, or four nuclei; and in the protoplasm there is frequently a large vacuole and a chromidium in the form of blocks or rods.

Some experiments were conducted on the resistance of these cystic forms. To test whether a cystic form is still living or not dilute eosine solution was employed, for it has been shown that living protoplasm will not stain with dilute eosine, but that staining takes place immediately after death. Accordingly the cysts were exposed to various adverse conditions and then tested for half an hour with the eosine solution. The cysts were killed by 1:1,000 sublimate in four hours, 1:250 creolin in five to ten minutes, 50 per cent. alcohol and boiling water immediately. Drying kills the cysts in a few minutes. Exposure to direct sunlight without drying kills most of the cysts in about three hours.

Freezing, on the other hand, for several hours kills only a small percentage of cysts. In ordinary water the cysts survive for three days, after which they begin to die if the bacterial growth is marked, but they will survive much longer (up to four weeks) if they are not killed by overgrowth of bacteria. In nature the cysts, when washed about by rain-water, will probably survive a long time, since they will not be exposed to such bacterial growth as would kill them.

Some experiments were conducted with house-flies. In no case were living cysts recovered from the gut of flies which had ingested them. Living cysts in small numbers could be recovered from the outer surface of the bodies of flies which had become contaminated with fæces, but so soon as the flies had cleaned themselves and dried then no further living cysts could be recovered. Accordingly the authors think that only under exceptional circumstances will flies be able to carry about living cysts.

As regards emetin, it was found that the histolytica forms were killed by an hour's exposure to a solution of 1 : 10,000. The *minuta* forms were more resistant and survived this treatment for over three hours, while the cysts were most resistant of all, for of fifty-one cysts only twelve were dead after a twenty-four hours' exposure. With a solution of 1 : 100, after half an hour's exposure, of fifty-seven cysts forty-four were dead.

"*Experimental Entamœbic Dysentery*" is the title of a paper by Ernest Linwood Walker with the co-operation of Andrew Watson Sellards, published in the August number of the *Philippine Journal of Science* (Section B, Tropical Medicine). The authors give an account of experiments made by them in Manila on prisoners, who volunteered for the purpose. The account of the work is divided into six parts, the first of which is an introductory review of previous investigations on this subject. It is mentioned that eighteen species of amœboid organisms have been described as parasitic in the intestinal tract of man, and of these at least five have been definitely stated to be more or less pathogenic. Some investigators have been led to the belief that amœbæ from water and other non-parasitic sources are capable, when taken into the intestine, of becoming facultative parasites, and in certain cases, at least, of causing dysenteric symptoms. Reference is made to a former publication, wherein one of the authors (Walker, 1911) showed that the amœbæ found in Manila water were distinct from the entamœbæ, and that the amœbæ culturable from the intestine of healthy persons, as well as dysenterics, were derived from cysts of amœbæ which had been ingested with the food and water, and were in no way connected with the entamœbæ, which are strict or obligatory parasites incapable of multiplying outside the body of their host and not culturable in Musgrave and Clegg's medium. One non-pathogenic species of *Entamœba* is recognized, viz., *E. coli*, which includes the *E. nipponica* of Koidzumi. There is one pathogenic species, *E. histolytica*, which includes *E. tetragena* (Viereck) and *E. minuta* of Elmassian. It is pointed out that dysentery has been produced experimentally in animals by rectal (Kruse and Pasquale, Strong and Musgrave), and in one case by intravenous (Gauducheau) injections of pus from liver abscesses containing entamœbæ but no culturable bacteria; and, finally, several investigators claim to have produced a disease in animals, and in one case in man, having the clinical symptoms of entamœbic dysentery with entamœbæ in the stools, and exhibiting the characteristic lesions in the intestine at necropsy, by feeding or injecting rectally "pure mixed cultures" of amœbæ and non-pathogenic bacteria, which had been isolated not only from stools of dysenteric patients, but from water and other non-parasitic sources. Recognizing the unsatisfactory nature of conducting such experiments on animals the authors have conducted a series of experiments on men in Bilibid Prison who had long sentences to serve, who had been under observation for years in the prison, and who ate cooked food and drank distilled water exclusively. The men have been under complete control, so that the existence or possibility of a natural infection with amœboid organisms has been reduced to a minimum. The organisms used in these experiments included all the species of *Amœba* that could be cultivated from the Manila water supply, from a variety of other non-parasitic sources both within and outside the Tropics, from the stools of healthy persons, and from the stools of cases of entamœbic dysentery; *E. coli* from healthy persons and persons suffering from diseases other than dysentery;* cysts of "*E. tetragena*" from "convalescents" and "contact carriers"; and motile *E. histolytica* from acute cases of entamœbic dysentery and from entamœbic liver abscess. The material was administered in capsule after mixing either with powdered starch or magnesium oxides. After feeding, the stools were repeatedly examined culturally as well as microscopically for amœboid organisms.

In Part II of the paper are described the experiments on men with cultures of amœbæ. Twenty feeding experiments have been made with cultures from eleven different sources, representing thirteen strains and eight species of *Amœba*. The amœbæ were cultivated on what is essentially Musgrave and Clegg's medium (agar 2·5 grm., sodium chloride 0·05 grm., Leibig's beef extract 0·05 grm., normal sodium hydroxide 2 c.c., distilled water 100 c.c.). The amœbæ were fed for the most part in the encysted condition, but in some cases young cultures free from encysted forms were used. A complete protocol of each man used in the experiments

* The term "convalescent carrier" is used for a person who has recovered from an attack of entamœbic dysentery, but who is still carrying the specific organism; a contact carrier is one who has not had dysentery, but who nevertheless carries the organism.

is given. The amœbæ (named species A—H) were all recovered from the fæces by culture (from the first to the sixth day only) after feeding, with the exception of species A and C. Species C was ingested only once, and species A five times in three different strains. Microscopic examination of the fæces was always negative as regards amœbæ, though in one case *E. coli* was found in the fæces of one of the men who was known to be harbouring the entamœba when fed with cultures of the amœba. On culture of this fæces the amœba, species E., was isolated, while *E. coli*, which was found microscopically, was not cultivated. The authors conclude this section by stating that it has been demonstrated experimentally that none of these amœbæ are capable of living parasitically in the intestinal tract of man.

Part III has to do with feeding experiments with *E. coli*. The author believes that the *E. williamsi* and *E. hartmanni* of Prowazek and the *E. brasiliensis* of Aragao are really forms of *E. coli*, which is the entamœba found commonly in the stools of healthy persons in tropical and sub-tropical countries.

In the experiments twenty men were fed with *E. coli*, five distinct strains having been used. It was fed mostly in the encysted condition, the stage with eight nuclei, and given in the manner described above for the amœbæ. The results with these experiments stand in striking contrast to those obtained by feeding the cultured amœbæ. Of the twenty men, seventeen became infected with the entamœbæ which were found microscopically in the fæces. Culture of the fæces was invariably negative. The period of incubation varied from one to eleven days, and none of the men have developed dysentery, though some of them have been under observation for two years and five months. From the uniform results it is concluded that *E. coli*, unlike the *Amœbæ*, is an obligatory parasite, and cannot be cultivated in Musgrave and Clegg's medium, and that it is non-pathogenic, and consequently plays no *rôle* in the etiology of entamœbic dysentery.

Part IV describes experiments with *E. tetragena* and *E. histolytica*. According to Schaudinn's original description of *E. histolytica*, this organism is distinct from *E. tetragena* (Viereck), but most authorities now believe that the two are identical, and that the four nuclear cysts of *E. tetragena* are the true cysts of *E. histolytica*. The experiments here to be recorded confirm this conclusion. Of twenty men who ingested *E. histolytica*, seventeen became infected at the first feeding, one required three successive feeds before becoming infected, and two who did not become infected at the first feed were reserved as controls. Sixteen of these men ingested *E. histolytica*, and in fourteen mobile entamœbæ appeared in the stool; four men ingested mobile *E. histolytica* (in two cases from liver abscess), and three of these became infected. The high percentage infected after ingesting mobile entamœbæ is due probably to the fact that the acid of the stomach was neutralized with magnesium oxide. Only one of the two men who ingested entamœbæ from liver abscess became infected. In the case of six of the men fed with encysted forms no neutralization was undertaken, and they all became infected. The entamœbæ appeared in the fæces from one to forty-four days after feeding (average nine days). Of the eighteen men who became infected with *E. histolytica* four have developed entamœbic dysentery. It is stated that "the large percentage of latent infections (78 per cent.) among these experimentally parasitized men was somewhat unexpected. However, the frequent occurrence of latent infections in entamœbic dysentery has been noted by a number of authors, and is well known to every clinician and pathologist working in the Tropics." No case of spontaneous entamœbic dysentery occurred in the ward during the period of the experiments with *E. histolytica*, so that the results warrant the conclusion that *E. histolytica* is a strict or obligatory parasite, that it cannot be cultivated in Musgrave and Clegg's medium, and that it is the essential etiological factor in endemic tropical dysentery. As a further result of these experiments it has been found that men fed with *E. histolytica* show "tetragena" cysts in their stools, and that at certain stages of the infection the entamœbæ acquire the characters of Elmassian's *E. minuta*, so that one may conclude that *E. tetragena* and *E. minuta* are in reality *E. histolytica*.

Part V is occupied with the application of the results to the diagnosis, treatment, and prophylaxis of entamœbic dysentery. For examination of any individual for entamœbic infection it is better not to administer a purge, for in the formed stool encysted forms are more likely to occur, and these are much more readily diagnosed than the free living entamœbæ. The differences between the free living forms of *E. coli* and *E. histolytica* are described, but it is admitted that the differentiation of the two is sometimes impossible. The encysted forms, however, present the most distinctive characters for making a diagnosis. In the matter of treatment it is most important to make a diagnosis, for *E. coli* is very common in the Tropics, and the indiscriminate treatment of all persons showing entamœbæ in their stools is as indefensible as would be the treatment with diphtheria antitoxin of every person showing a culture of any bacillus whatsoever from his throat. On the other hand, diagnosis is necessary in the case of chronic and latent cases of entamœbic dysentery, for these are sources of infection in endemic regions, first, because of their relative prevalence; secondly, because this condition persists indefinitely; thirdly, because their infection is unsuspected; and fourthly, because these "carriers" are constantly passing in their stools, often in enormous numbers, the resistant, encysted stage of *E. histolytica*. "The knowledge of the part which these 'carriers' of *E. histolytica* probably play in the spread of entamœbic dysentery, together with the ease and certainty with which such 'carriers' can be detected by microscopic examination of their stools, makes the prophylaxis

of the disease relatively simple. It is believed that it would be possible, were it practicable, to eradicate this disease from any region by a systematic examination of stools and the treatment or isolation of all persons found to be carriers of *E. histolytica*. In the absence of such thoroughgoing prophylactic measures, a sanitary disposal of all fæcal matter should be insisted upon, and household 'carriers of *E. histolytica* should be eliminated."

In the matter of personal prophylaxis the authors believe that a monthly examination of the stools of persons residing in endemic centres would ordinarily be sufficient to anticipate and prevent an attack of entamœbic dysentery. The paper describes the methods for separating and distinguishing the pathogenic and non-pathogenic entamœbæ, and concludes with Part VI, which is summary and conclusions to be drawn from the foregoing results.

A New Sign in Kala-azar.—The *Lancet* for August 9, 1913 (p. 392) contains a paper by Dr. R. A. P. Hill on a new sign in kala-azar which, if found to be of constant occurrence, should be a great help in diagnosis. The author has seen eleven cases of the disease in Pekin during the past two years, and in only one instance was the patient over 12 or 13 years of age. Further south in China adult cases appear to be more common. The sign referred to is a peculiar action of the blood when diluted with a special diluting fluid which the author uses in making leucocyte counts. In other diseases the blood mixes with the fluid quite readily, but in eight consecutive cases of kala-azar the author has found that even with the utmost expedition one cannot prevent the blood from clumping, so that it becomes impossible to make a blood count with the use of this fluid. The diluting fluid is made in the following way:—

A. (1) Wright's modification of Leishman's stain, saturated and filtered (presumably in methyl alcohol), 2 parts.

(2) Pure methyl alcohol, 1 part.

B. 0·1 per cent. solution of sodium chloride in distilled water.

For use add 1 part of A to 3 parts of B, shake well, and use within half an hour. If a precipitate forms or the cells overstain add a little more methyl alcohol to A. Dilute the blood 1 in 20 or 25, and mix promptly. If the mixing is done too slowly lumps may form in any blood, but in kala-azar it is impossible with the utmost expedition to avoid lumping. Of the eight cases it was least marked in one that apparently recovered under big doses of quinine.

Cerebral Malaria.—Patterson contributes an interesting article upon the cerebral form of pernicious malaria in the *Journal of the American Medical Association*, November 15, 1913. He recognizes the following types: (1) The comatose type, (2) the motor irritative type, (3) the motor depressive type. Coma is a symptom of all the types, the associated symptoms varying with the different types. As a rule, cerebral malaria does not occur with the first paroxysm, but is preceded by several. Its onset is always sudden, occurring with startling swiftness. Cases illustrative of the different types are given; the conclusions the author reaches are as follows:—

(1) Cerebral malaria may assume the form of any brain disease.

(2) It is practically never due to the first paroxysm but to succeeding ones, and by energetic treatment of the first paroxysm it may be prevented.

(3) Quinine hypodermically acts specifically, but the drug must be given for effect—the dose usually being 9 to 12 gr. every four hours.

(4) Cerebral malaria is a frequent disease in malarial districts.

Leprosy.—Bayon, in the *British Medical Journal*, November 29, 1913, writes on the clinical and bacteriological aspects of leprosy. He believes that knowledge of the contagious nature of the disease is founded on the following substantial observations:—

(1) That it is a disease due to a definite micro-organism.

(2) That in Northern Germany, where the disease had been reintroduced from Russia in modern times, the infection was found to have spread concentrically from the first imported cases.

(3) That the overwhelming majority of cases originate in countries where leprosy is relatively common.

(4) That in the rare cases in which the disease has been contracted in countries where leprosy is not indigenous, such as England, Holland, and Southern Germany, we are able in every case to prove the more or less intimate contact with lepers who in their turn came to these districts after a more or less prolonged stay in a leprosy ridden country.

(5) That in countries where leprosy is relatively rare the disease is found to be bound to definite foci or families. This has been observed in the Alpes Maritimes, on the Riviera, and in the Valais (Switzerland).

(6) That the countries which have carried out universal segregation have been rewarded by a gradual and constant diminution of the disease.

(7) That where segregation has been abandoned or loosely carried out the scourge has attacked an ever-increasing number of individuals.

The author's statistics seem to show clearly that contagion or infection through immediate contact is the usual mode of transmission, and this being so, it is rather far-fetched to seek an insect carrier of the scourge. All experiments to prove this mode of dissemination have so far failed, though it appears quite probable that the common house-fly can suck up the germs of the disease from open sores, and carry them about for several days. As regards treatment, nearly every imaginable drug has been tried, and a great number are still under

experiment in the hope of discovering a cure for leprosy; but so far there is no specific and sure method of treatment.

In its initial stages leprosy affects the general well-being and appearance of an individual to such a slight extent that any therapeutic effort which succeeded in arresting the disease in its early stages in a fair proportion of cases would practically amount to a cure.

Spontaneous remissions of the disease and spontaneous apparent "cures" occur, however, in a small proportion of lepers, and may last for several years, in some instances as long as fifteen years or more, but afterwards the disease may again become virulent and rapidly kill the patient. Therefore any drug or method of treatment must stand the test of time, five years or more, and be applied to a sufficient number of patients.

Without taking into consideration these important initial factors, it is absolutely irresponsible to speak of cure in a disease so chronic, slow, and intractable as leprosy is known to be.

For all advanced nodular stages Chaulmoogra oil, or, better, its refined constituent "antileprol," injected intramuscularly in doses of 3 to 5 c.c. is still the best palliative the author knows. The injections should be repeated every three days, and the course should last five months or more if the patient can stand it. Chaulmoogra oil and antileprol can also be given internally in small capsules, and for this mode of treatment antileprol is decidedly preferable, as it does not cause the gastric disturbances produced by the unrefined oil. Doses varying between 15 minims and ten times that quantity can be taken daily.

Cases in the early macular stage appear to respond better to other forms of treatment. A cultural extract has also been prepared from the micro-organism of leprosy isolated by Kedrowsky on lines similar to those used in the preparation of Koch's *alt-tuberkulin*.

Notes and News.

THIRD INTERNATIONAL CONGRESS OF TROPICAL AGRICULTURE, LONDON, 1914.

Association Scientifique Internationale d'Agronomie Coloniale et Tropicale.

[Preliminary General Circular.]

Preliminary Notice.

The International Association for Tropical Agriculture (Association scientifique internationale d'Agronomie coloniale et tropicale) has decided to hold in London, in June, 1914, an International Congress, in which all countries interested in Tropical Agriculture and Forestry are invited to participate. The Association has requested the Committee of the British Section, whose headquarters are at the Imperial Institute, to make the necessary arrangements for the meeting, in co-operation with the Bureau of the International Association in Paris.

The Congress will be held at the Imperial Institute, South Kensington, London, S.W. It will open on Tuesday, June 23, and close on Tuesday, June 30, 1914.

Order of Business.

In the order of business at the Meeting, the morning sittings (10 a.m. to 1 p.m) will be reserved for papers and discussions on subjects of general importance, each morning being devoted to a single subject; the afternoon sittings (3 to 5 p.m.) will be reserved for papers and discussions on special subjects.

Transactions.

Communications intended for the Congress may be made in English, French, German, or Italian; but the general language of the Congress will be English.

The following subjects are suggested for papers and discussion at the morning meetings. Contributions on these and similar subjects are invited:—

I. Technical Education and Research in Tropical Agriculture.

II. Labour Organisation and Supply in Tropical Countries.

III. Scientific Problems of Rubber Production.

IV. Methods of developing Cotton Cultivation in New Countries.

V. Problems of Fibre Production.

VI. Agricultural Credit Banks.

VII. Agriculture in Arid Regions.

VIII. Problems in Tropical Hygiene and Preventive Medicine.

Papers for the afternoon meetings are invited on the following subjects:—

I. Problems relating to Tropical Agriculture and Forestry.

II. The Cultivation and Production of—Rubber, cotton and fibres, cereals and other food-stuffs, tobacco, tea, coco-nuts, other agricultural products, forest products.

III. Plant Diseases and Pests affecting Tropical Agriculture.

Papers recommended for publication and Reports of Discussions will be published at the close of the Congress.

Subscription.

The subscription for membership of the Congress will be £1, entitling members to admission to all meetings and receptions and to receive the volume of printed papers and discussions on publication. Those desiring to become members of the Congress are requested to fill in a form, which may be obtained from the Imperial Institute, and return it to the Organising Secretaries for the Congress, as soon as conveniently possible, in order that their names and permanent addresses may be registered.

Notices.

A General Programme, with the complete arrangements, will be forwarded to all registered members before the Meeting.

Arrangements will be made for the accommodation of members of the Congress at suitable hotels.

Arrangements have been made by the Organisers of the International Rubber Exhibition and of the International Cotton, Fibres, and Allied Industries Exhibition to hold these Exhibitions during the period of the Congress, at the Royal Agricultural Hall, Islington, London, N. Members of the Congress will receive free Season tickets of admission to the Exhibitions; and special means of conveyance between the Imperial Institute and the Agricultural Hall will be provided.

The Organising Committee cordially invite all who take an interest in Tropical Agriculture and Forestry to attend the Congress and to make the contents of the present circular as widely known as possible.

All correspondence relating to the communication of papers and the arrangements for the Congress should be addressed to:—

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Third International Congress of Tropical Agriculture,
Imperial Institute,
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Drugs and Appliances.

EXPERIENCES WITH ARSEN-TRIFERRIN.

ARSEN-TRIFERRIN was used by Dr. K. Jochem, Berlin, in thirty-two cases of anæmia, scrofula, and malnutrition, after nervous exhaustion and debility, after severe illnesses, and finally in diseases of tubercular origin. It proved of excellent service in all the cases. No objection was raised on the score of taste or agreeableness. The author ordered the preparation half an hour after meals, three times a day, children taking one tablet, adults two tablets at a time. Condiments and fruit must be avoided while Arsen-Triferrin is being taken. Patients who had complained of loss of appetite were soon endowed with an increased appetite. In all cases the author observed an improvement in the general condition within a short time, as well as an increase in bodily vigour. The author gave Arsen-Triferrin to ten children, 6 to 13 years old, after they had recovered from whooping-cough, in order to compensate for the debility, and the results were excellent.

Arsen-Triferrin was given to the same number of young patients, both males and females, varying in age from 13 to 18 years, because of the debility and anæmia associated with puberty, and the results were all exceedingly good. For example, a lad, aged 16, became very anæmic owing to excessive growth and premature overstrain, but an excellent result was established after the use of six boxes of Arsen-Triferrin tablets.

Recent and Current Literature.

A list of recent publications and articles bearing on tropical diseases is given below. To readers interested in any branch of tropical literature mentioned in these lists the Editors of the JOURNAL OF TROPICAL MEDICINE AND HYGIENE *will be pleased, when possible, to send, on application, the medical journals in which the articles appear.*

"The Medical Journal of South Africa," vol. ix, No. 3, October, 1913.

Tuberculosis in the Mines of South Africa.—Allen brings forward figures which show that tuberculosis is common amongst native miners in South Africa. Thirty per cent. of these cases are found in imported natives, forty-two per cent. being due to infection in the mines themselves. No local measures, the author states, can be expected to accomplish much with such a steady annual influx of fresh cases. [If all natives imported were thoroughly examined and those suffering from tuberculosis rejected, the incidence of the disease would manifestly be reduced.]

"Journal of the Royal Army Medical Corps," vol. xxi, No. 4, October, 1913.

Phlebotomus Fever in Aden.—Loughnan writing on this subject describes the habits and species of the sand-flies found in Aden. He states that four specimens of sand-flies captured in the beginning of June were sent to the Royal Army Medical College for identification, where they were pronounced to be *Phlebotomus minutus*. The adults have been found with difficulty in dark areas of inhabited barracks, bungalows, native huts, and in caves frequented by camel men and sweepers. About half an hour before sunset on calm evenings the sand-flies take to flight, and are attracted by human beings, by burning lamps, by white articles such as writing paper, tablecloths, shirts and towels, on which they temporarily rest. These flies are found sparsely distributed during the colder months, but increase in numbers with the onset of the monsoon from the end of May, when the temperature averages 95° F. and the humidity of the atmosphere is greater than during the colder months.

After careful searches, the author has never been able to discover the breeding-places of these flies, although the geological conditions might be considered suitable to the growth of insect life which prefers slight moisture, dark, secluded caves, associated with crannies and holes, in the vicinity of human habitations, particularly where crumbling lava, pumice, rubble and igneous sand are to be found, with slightly varying temperatures, from sea-level to a height of 1,700 ft.

Notices to Correspondents.

1.—**Manuscripts if not accepted will be returned.**

2.—**As our contributors are for the most part resident abroad proofs will not be submitted to those dwelling outside the United Kingdom, unless specially desired and arranged for.**

3.—To ensure accuracy in printing it is specially requested that all communications should be written clearly.

4.—Authors desiring reprints of their communications to the JOURNAL OF TROPICAL MEDICINE AND HYGIENE should communicate with the Publishers.

5.—Correspondents should look for replies under the heading "Answers to Correspondents."

Colonial Medical Reports.—No. 12.—Sierra Leone—(*continued*).

SMALL-POX.

THERE was no outbreak of this disease either in the Colony or Protectorate.

The only authentic case officially notified was one of the native crew landed from a steamer. This case was seen by a medical officer and was immediately isolated, and admitted to the Small-pox Hospital at Kissy; his comrades on board, who were also landed, were segregated at the lazaretto and were immediately vaccinated. There was no fresh manifestation of the disease.

In the Protectorate there were few cases reported, and there was no epidemic outbreak.

VACCINATION.

This was kept up fairly regularly during the year in the Colony and Protectorate. The lymph, still obtained from the Liverpool Institute of Comparative Pathology, continues to give most satisfactory results, a high percentage of successes being obtained when it was used within a reasonable time after its arrival in the Colony. To the use of this lymph must certainly be attributed the comparative freedom from small-pox for the past three years.

The total number vaccinated was 7,443, and of these 6,491 were successful, 430 unsuccessful, and 522 were not seen again, the proportion of successes being 87 per cent. of the total done.

QUARANTINE.

Only once during the year were quarantine restrictions imposed; this was in the case of the s.s. "Addah," which arrived in port with a case of small-pox on board. As already stated, the case was immediately isolated and admitted into the Small-pox Hospital at Kissy, and all other necessary precautions taken to prevent any outbreak or spread of the disease. New quarantine regulations, more in accord with modern ideas, are being drawn up, and will be in force at an early date.

The new sanitary station at the Cape, about five miles from the harbour, chiefly for the segregation of persons during yellow fever, cholera, or plague outbreaks, was almost completed; it now requires to be enclosed, with a suitable fence, and the furniture still remains to be completed. The station contains the following buildings: One large European barri (or house on native model); six large native barris (or houses on native model).

A hospital, dispenser's quarters, a guard house, kitchens, disinfecting chamber, mortuary, washhouses and latrines; all the latter are permanent stone structures, the seven barris are modified native houses. Each native barri is enclosed within its own wire fence, so that the occupants of one barri can have no communication or contact with those of another. Each is capable of accommodating fifty people. A new disinfecting house for Freetown has been built; it is situated on the quay at a convenient distance from the landing-place and jetties. This chamber consists of four apartments; a Clayton's disinfecting machine is placed in one which communicates by a small opening, for the passage of the tubes of the machine, with two of the other rooms, the remaining room is intended for a store for disinfected articles awaiting shipping. With the completion of the sanitary station, and the disinfecting chamber fitted with a Clayton's machine, this Colony may be considered fairly well equipped for fighting any outbreak, or introduction from shipping, of infectious disease.

SANITATION OF FREETOWN.

During the year the sanitation of the city was carried on as usual by the Sanitary Department of the City Council. The scavenging was under the direct control of the same department, with the result that the work was done more efficiently and more economically than when it was let out to contractors.

The following returns show some of the work done by the sanitary inspectors during the year in the prevention of nuisances: Number of summonses, 32; number of convictions, 26; amount in fines, £6 2s. 1d.; amount received from owners of neglected lots cleaned by the Sanitary Department, £6 9s. 2d.; persons arrested for committing nuisances, 50; number of warning notices for abatement of nuisances served, 2,230; number of warning notices *re* cesspits, 142; number of dead animals found and buried, 38; amount of diseased meat found and destroyed, 1,613 lb.

During the year the following minor sanitary improvement works have been carried out by the Government: Incinerators (for ordinary refuse matter, new ones built, slightly modified in shape from the first one built in 1908), 4; dust-bins of the new covered type, 11; public laundries, 4, bringing the totals of each up to—incinerators, 5; dust-bins, 20; public laundries, 6.

It is hoped that by the end of 1910, if the proposed programme of minor sanitary improvements be carried out, that a sufficient number of the above will be provided to meet the present requirements of the town.

A cattle market has also been provided, the land being granted by the Government to the City Council for the purpose; it is situated at the north end of Hagan Street on high ground, close to the beach, from which a good road has been made up the cliff. This market does away with the great inconvenience and risk to the public formerly experienced by the driving of cattle through the streets, and holding the market in one of the principal thoroughfares, this going on at all hours of the day. The new market is being railed in and drained and suitable stalls for tethering cattle are being provided.

The incinerators mentioned above, the first introduced by me in 1908 having been found to work so satisfactorily, are now being adopted as the type of rubbish destructor for general use in Freetown; they are cheap in construction, economical in

working (no special fuel being required), and efficient in action, and a great improvement in every way on the burning pits and rubbish shoots formerly in general use throughout the town, and which were at once so unsanitary and so unsightly.

During 1910 the following programme of sanitary improvements are proposed to be carried out: (1) Incinerators, 4; (2) dust-bins, 12; (3) laundries, 4; (4) draining public stand-pipes; (5) levelling up of streets; (6) continuation of general drainage scheme; (7) repairs of streets; (8) a fish market to be provided.

There is one mule and one bullock cart in use at present in connection with the scavenging of the town, but a few more are very much needed in the large scattered area to be dealt with.

The question of the disposal of excreta, and some modification in the way of improvement in the present cesspit system, are still under consideration.

The Teaching of Hygiene in Freetown.

Elementary hygiene continues to be taught regularly in all the secondary schools, the sum of £180 being voted by the Government for distribution in prizes to the schools and scholars as an encouragement for the study of the subject. At the annual examination held in December a hundred pupils entered, thirty-two more than the previous year, with the following results:—

1	obtained over	90	per cent.	marks		
2	,,	,, 80	,,	and under	91	
9	,,	,, 70	,,	,,	81	
7	,,	,, 60	,,	,,	71	
17	,,	,, 50	,,	,,	61	
22	,,	,, 40	,,	,,	51	
20	,,	,, 30	,,	,,	41	

The five schools represented received £20 each, the candidate who received highest marks received £5, and the seven next best candidates received £2 each.

So far as I can judge, the teachers and scholars continue to take a keen interest in the subject.

Sanitation in the Protectorate.

During the year a scheme was outlined by which medical officers were enabled to assist and take an interest in the sanitation of towns in the Protectorate. The scheme was energetically taken up by Drs. Jackson-Moore and Murphy in the Ronietta and Koinadugu districts respectively, and their reports showed that the Chiefs and their people were on the whole eager to carry out any suggestion made in regard to the improvement of their towns, it seemed to be quite the exception to meet with opposition or indifference to the advice given in these two districts; it may be truthfully stated that the Protectorate sanitation scheme has so far worked satisfactorily, so far as these two districts are concerned. In the Koinadugu district, Dr. Orpen reported that the people were decidedly indifferent, but there is no reason to fear that, with a little persistence, they will in time come round to see the advantages of cleanliness in their immediate surroundings and see the good in the white "medicine man's" advice.

Unfortunately, in several districts patrolling for any purpose is not always possible, owing to local medical duties. Medical officers in the Protectorate are now called upon to carry out the following varied duties as well as their ordinary purely medical work, *viz.*:—(*a*) To patrol their districts and instruct the natives in sanitation; (*b*) to patrol for purposes of vaccination; (*c*) to assist in the study of entomology; (*d*) to study the prevalence, &c., of such diseases as syphilis, leprosy, sleeping sickness, &c; (*e*) to select and inspect sites for quarters and report on water supplies; (*f*) to make special study of blood-sucking flies as to their prevalence and localities; (*g*) to specially report on each of these; (*h*) to act as Deputy District Commissioners.

Taking into consideration the various duties medical officers are now called upon to perform in connection with the practice of their profession in the Protectorate, I think it is high time that they should be completely exempted from taking any part in purely administrative duties. As to Deputy District Commissioner's duties, it now frequently happens that a medical officer has to give up most of the time that he could have given, with much more benefit to the country, to some of the other and more congenial subjects with which he is expected to deal.

Anti-malarial Sanitation in Freetown.

(1) Anti-malarial sanitation has now become an essential part of general sanitary measures, and any observations on general sanitation in reference to a town or a Colony in Tropical Africa must be interpreted as including in their scope—and a very important portion of them—measures directed to the alleviation of malaria generating conditions.

In this Colony the following anti-malarial sanitary measures were practised during the past year—1909:—

(2) In Freetown the regular collection of refuse, likely to act as breeding haunts for mosquitos, *i.e.*, old tins, bottles, calabashes, and such-like useless articles, from compounds and houses and their final disposal either by dumping into the sea, or by burial. A special look-out was kept up by the Sanitary Inspectors for the presence of mosquito larvæ in water receptacles in compounds, the importance of this subject being periodically impressed upon them. During the rainy season the rapid growth of weeds and grass was kept down as effectively as possible, so that they did not form haunts for mosquitos and other insect pests. A minor sanitary improvement which was appreciated and taken full advantage of by the poorer inhabitants was the free supply and distribution of rubble, small stones, and sand, from the Government quarry; this was conveyed by the railway to convenient centres in the town, the people being duly notified, and the material taken by them to their own homes for the purpose of filling up and levelling their compounds and yards where neces-

sary, which measure was the means of preventing the formation of stagnant pools of water, during the rainy season, in many premises which formerly provided numerous mosquito breeding pools.

(3) The following sanitary works, which should rightly be considered as within the sphere of anti-malarial sanitation, were carried out during the year by the Public Works Department, at an outlay of £1,698 17s. 3d., namely:—(1) New drains and concrete gutters constructed, 3,350 lin. ft.; (2) Non-masonry drains, *i.e.*, drains cut in laterite or soil, 10,000 lin. ft.; (3) Lengths of streets ballasted and levelled up, 7,000 lin. ft.; (4) Area of stone paved roads laid, 4,500 sq. ft.; (5) Culverts repaired and cleared, 87 sq. ft.; (6) New culverts constructed, 25 sq. ft.; (7) Public open air laundries built, 4 sq. ft.

The laundries are constructed, where possible, in the course of existing streams, and their connection with anti-malarial sanitation is that their presence will do away with the necessity or excuse for the damming up of the watercourses by the washer-women in order to form pools for washing clothes in. These washing places are very much appreciated by the people; they consist of rows of masonry butts, lined with cement, each butt having a supply tap and a waste pipe, the waste water being conveyed into the neighbouring drains or streams.

(4) The improvement of the drains and streets will be continued by the Government during 1910, and one very important drainage reform is now being taken in hand, namely, the provision of suitable masonry drains from all the public stand-pipes. These stand-pipes have been, up to now, a constant source of insanitary conditions in their immediate neighbourhood, owing to the presence of stagnant pools fed by the waste water from them, there being no proper drainage to carry it off. With such a glaring defect in the present drainage system of the town it becomes a delicate and a difficult matter for the sanitary authorities to attempt to enforce by the police court compliance with the Public Health Ordinance, especially in regard to anti-malarial sanitation.

(5) The death-rate of Freetown for the year was 19 per 1,000; this compares very favourably with the two previous years, and is, in fact, the lowest recorded death-rate for the city, as the following yearly death-rate per 1,000 shows:—

1897 ... 26	1900 ... 26	1903 ... 23	1906 ... 23
1898 ... 25	1901 ... 27	1904 ... 26	1907 ... 21
1899 ... 27	1902 ... 24	1905 ...*29	1908 ... 22
	1909 ... 19		

* Severe small-pox epidemic.

The deaths recorded as being due to malarial fevers numbered 119, a marked decrease as compared with the two previous years, as shown here:—1907, 202; 1908, 150; 1909, 119.

The number of Europeans resident in the Colony during the year was estimated at 620, and there were five deaths among them, as follows:—Officials, 2; military, nil; commercial, &c., 3.

Hill Station.

From a climatic point of view I think the good name of Hill Station may be said with truth to have been maintained during 1909. There were in all fifty-four residents during the year, of whom thirty were temporary, mostly military men and their wives, who were permitted to rent bungalows of officials on leave. There were sixteen admissions on sick list, five of which were due to climatic causes, *viz.*:—Remittent fever, 4 cases; dysentery, 1 case. Of these, two were officials, and of the remaining three cases two were cases of remittent fever contracted on the Hill, so far as I could judge, as neither patient ever remained a night out of Hill Station. One of these, the wife of an Army officer, had not used a mosquito net for six or eight weeks previous to her attack, and the remaining case was one of dysentery contracted in the Protectorate.

The two officials belonged to the Audit and Railway Departments respectively, and no doubt their cases resulted from infection during duty trips in the Protectorate.

The chief characteristics of Hill Station from a climatic and health standpoint are:—(*a*) Its marked freedom from mosquitos and most other winged insect pests, these being only very occasionally seen or heard; (*b*) Its cool and pleasant breezy atmospheric conditions, especially at night; (*c*) Its restful quiet at night as compared with residence in or near a native town, in which night is made hideous by the barking of dogs, the beating of tom-toms, and the stupefying stuffiness of the atmosphere, which is only disturbed by the persistent attentions of mosquitos.

During the year some defective surface drains were put in order and extended well away from the quarters.

Many of the compounds still remain unfenced, much to the annoyance of residents, who try to improve their surroundings by laying out gardens for the growing of flowers, fruit, vegetables, &c. The interest of residents in their quarters is still very noticeable by the care and skill shown in the arrangements of the compounds.

A residence for the General in command of the Garrison was built during the year. This is a very substantial stone building, the advantages of stone over wood being very marked in the greater coolness of the apartments as compared with a wooden house.

The sanitary arrangements were carried out satisfactorily during the year. The sanitary trenching ground was condemned owing to a possible contamination of the Freetown Water Supply catchment area, and a new ground selected for the purpose, which is more central and equally suitable, and quite free from any risk of contaminating water sources. One of the outstanding drawbacks in Hill Station cantonment as a residence is the, at present, great liability to a water famine in the dry season, owing to the defective condition of the reservoirs, which are incapable of holding water for any time after the rainy season ends, when we are

compelled to depend on a constantly diminishing streamlet that barely fills the small dam above the reservoirs, and from which our quarters are directly supplied. Even with every precaution against waste Hill Station water supply for two months or more in the year is at present very critical and uncertain. This unsatisfactory state of things is all the more deserving of adverse criticism, when we know that with well-constructed receptacles an ample supply of water could be provided, as in the rainy seasons an unlimited quantity could be collected.

There is another sanitary defect which requires attention, and that is the surface drains on each side of the roads around the station. These are at present mere gutters excavated in the soil, which are being year by year washed away, resulting in the formation of deep holes along their courses, which, owing to the stagnation of water in them, must in time become insanitary and lead to some of the malarial conditions found in Freetown. These drains should be attended to, and be laid down with the egg-shape drain-pipe sections now being laid in Freetown drains; and I would point out that the sooner this is done the less it will cost, as every rainy season washes more of the existing gutters away.

At the end of the year the temporary prison and the twenty to thirty prisoners accommodated therein were removed, and the sanitary gang of labourers were as a consequence increased from twelve to thirty-two. The chief work of the twenty extra labourers will be clearing and rooting the bush around the bungalows, the ordinary sanitary duties being performed as usual.

METEOROLOGICAL RETURN FOR THE YEAR 1909.

	Temperature					
	Solar maximum	Minimum on grass	Shade maximum	Shade minimum	Range	Mean
January	137.4	64.2	93.4	70.0	23.4	81.7
February	142.0	65.8	99.4	70.6	28.8	85.0
March	146.8	69.0	95.6	68.0	27.6	81.8
April	147.0	69.4	94.4	69.0	25.4	81.7
May	151.4	69.8	94.4	68.2	26.2	81.3
June	150.2	68.0	93.6	67.6	26.0	81.6
July	149.4	68.0	87.4	67.0	20.4	82.5
August	148.4	67.0	81.8	67.8	14.8	74.4
September	152.4	69.0	93.4	67.2	26.2	80.3
October	153.4	69.0	94.0	67.6	26.4	80.8
November	145.0	68.4	94.6	69.0	25.6	81.8
December	140.4	63.4	92.2	68.8	23.4	80.5

	Rainfall		Wind	
	Amount in inches	Degree of humidity	General direction	Average force
January	0.10	68	NW	1
February	0.33	64	NW	2 57
March	3.26	66	NW	1
April	3.18	64	N	1
May	10.37	73	N	1
June	21.04	78	C	1
July	28.79	81	NW	2
August	38.96	84	NW	2
September	16.45	83	W	2
October	12.62	79	NW	1
November	5.70	74	W	1
December	0.86	72	C	1
Total	141.42			

HOSPITALS AND DISPENSARIES.

COLONIAL HOSPITAL, FREETOWN.

(By DR. D. BURROWS.)

The Hospital was administered from the beginning of the year until April by Dr. Burrows, and from then until the end of October by Dr. Kennan, the Senior Medical Officer, and from then until the end of the year again by Dr. Burrows.

Improvements and Alterations.—In the building, a new latrine for the exclusive use of out-patients was erected. A new room was added to the nurses' quarters attached to the female wards. This will be productive of greater comfort to the nurses and also ensure their more effective control. A new kitchen is in process of construction, and this will be productive of greater comfort to the junior male staff, under whose rooms the old kitchen was very assertive.

The Out-patients' Department has been renovated and painted with oil-paint, thus making it capable of more efficient cleaning and also more attractive and wholesome looking.

While these additions are steps in the direction of improvement, they are at the best patchwork, and as the prospect of a new hospital is now within sight, further comment is withheld. But the fervent hope is expressed that the Outpatients' Department in the new scheme will be so arranged as to ensure its complete isolation from the other parts of the Hospital, the lack of which arrangement now entails much vexation of spirits, loss of time and, presumably, of material, to say nothing of the almost impossible task of maintaining discipline.

The improvements noted last year in the direction of clothing stores for each ward have more than justified their inception. The inventories of all departments have, in consequence, been maintained at a surprisingly accurate level. I would draw attention to the gratifying increase in the total amount of work done, and feel safe in asserting, after due experience in the working of this Hospital, that the limit of its utility has been reached. This statement is by no means meant to suggest that more work will not be done, but that more cannot be done without the provision of greater accommodation and necessarily of an increase in the medical and nursing staff of the Hospital.

The average number of patients in Hospital per diem was fifty-five during the year under report. During 1908 this figure stood at forty-one. When the maximum accommodation of the Hospital—*viz.*, sixty-two beds—is considered, these figures are highly satisfactory, especially as six beds are reserved more or less for paying patients, and further as certain beds are, when possible, kept vacant for surgical and midwifery cases, to the exclusion, unfortunately, of deserving medical cases.

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We have again further cause for satisfaction. Not only has there been a material drop in the total number of deaths from 128 to 107, but the proportion of deaths to cases treated has dropped from 13 to 8 per cent. Of the total number of deaths forty-eight were within seventy-two hours of admission, and, as usual, these cases were moribund on admission, so that of the remaining number of deaths, *viz.*, fifty-nine, the Hospital may be reasonably pleased at the unavoidable mortality being reduced to barely 5 per cent. of the admissions.

The actual number of cases treated as intern patients may not be in excess of any recorded, but the salient feature of this return lies in the fact that the accommodation of the Hospital was taxed to its utmost through every day of the year. The large numbers recorded for 1903, 1904, 1905, are accounted for by the fact that cases were taken in and accommodated on the floor, thus overcrowding the wards. This objectionable practice has rightly been discontinued.

Before commenting on the returns of surgical operations for the year under report a glance at the following figures will give some indication of the progress made in this particular direction.

Number of operations performed, 1902, 44; 1903, 126; 1904, 145; 1905, 179; 1906, 146; 1907, 190; 1908, 136; 1909, 207, other anæsthetics, 10; total, 217.

It will be seen that the number of operations performed in 1909 was 217, and this is greater than the number for any previous year, and when the number of deaths after operations, *viz.*, eight, is considered, these figures are satisfactory from every standpoint. The range of operations was extensive, and the success attendant on them is highly creditable to the after-care and attention bestowed.

Owing to the limited staff of the Hospital it is found convenient to perform operations on only two days a week. These operations are more or less of an urgent nature, and the consensus of opinion of all medical officers who have been attached to the Colonial Hospital is, that this number could be easily doubled, and that surgery of the relieving order, such as for deformities, diseases of the eye, &c., could be practised with considerable effect if the medical and nursing staff of the Hospital were adequately increased. Surgery under existing conditions involves a degree of preparation and after-anxiety out of all proportion to the severity of the operations, and until a distinct surgical side—not merely a ward as at present, and even this at times is utilized for medical cases—is provided, the present unsatisfactory method must unfortunately continue. In the meantime we wait, but our efforts and their results we may justly urge as a plea for improved accommodation and an increased staff.

Paying Out-patients.—We commented on the insignificant sum of £10 which was received last year in return for relief afforded in the Out-patients' Department. We have an increase of over 5,000 out-patients for 1909, and, sad to tell, the receipts have fallen to the deplorable amount of £6 18s. 0d., or, to put it in a more convincing light, the 27,474 out-patients contributed $\frac{1}{17}$ of a penny each for the treatment received.

The amount received for the dispensing of private prescriptions of medical officers was £16 10s. 10d., this amount including moneys paid for trusses, syringes, bandages and other appliances. These prescriptions numbered 360.

It may not be out of place to record that apart from making up of the prescriptions for 27,474 out-patients the daily average of fifty-four in-patients, the number of prescriptions sent by Government officers, for themselves and their families, numbered 2,246 during the year.

This involves no light task on the Resident Dispenser and his Assistant, who have incidentally to supervise the dispensing done by the juniors undergoing training.

Clinical Laboratory Report.—This Department has more than justified its inception, and though conducted at some personal inconvenience, has been productive of results which urge the necessity for greater facilities being granted to continue and expand its utility. We do not pretend that research work can be essayed with the present limited staff of medical officers attached to the Hospital, but much could be done to secure more efficient clinical results, and, more important still, in the matter of securing material and collections of parasites for the Schools of Tropical Medicine in England. In the daily routine of work, opportunities come to hand of securing material which the Schools would greedily assimilate, and which are invaluable to the special training in tropical medicine insisted on in the case of candidates for the West African medical staff, but which, perforce, cannot be taken advantage of owing to the lack of time and of the necessary number of trained medical officers.

The number of recorded cases subjected to microscopic examination was 196. This by no means represents the full number of cases examined as unfortunately a large number were not entered, and this is exclusive of the work done on a tour through the Colony by Dr. Burrows, for the purpose of obtaining information as to the prevalence of yaws, syphilis, and towards preparing a malarial index of the Colony.

The following table shows some of the results obtained:—

Nature of subject examined	Results	Remarks
Malaria—benign tertian ...	7 ...	
,, sub-tertian ...	14 ...	No crescents found.
,, quartan ...	*nil* ...	
,, negative ...	45 ..	Thus including malarial infection.
Filaria—mature male *F. loa* ...	1 ...	
,, ,, female *F. loa* ...	2 ...	All from same case. *Vide* appendix.
,, *M.F. diurnæ* ...	1 ...	
Sputum—*B. tuberculosis* ...	6 ...	Specimens taken indiscriminately.
,, Negative ...	18 ...	

Return of Diseases and Deaths in 1909 at the Colonial Hospital, Sierra Leone.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	4	1	4
Anæmia	—	—	—
Anthrax	—	—	—
Beri-beri	1	—	1
Bilharziosis	1	—	1
Blackwater Fever	1	1	1
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	36	—	37
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	22	7	22
Enteric Fever	—	—	—
Erysipelas	—	—	—
Febricula	12	—	12
Filariasis	1	—	1
Gonorrhœa	5	—	5
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	2	—	2
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	2	—	2
Quotidian	—	—	—
Tertian	9	—	9
Quartan	—	—	—
Irregular	65	2	66
Type undiagnosed	—	—	—
(*b*) Remittent	35	—	36
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	1	—	1
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	—	—	—
Malignant	—	—	—
Old Age	5	3	5
Other Diseases	24	2	25
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	72	1	73
Rheumatoid Arthritis	4	—	5
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	3	2	3
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	—	—	—
(*a*) Primary	5	—	5
(*b*) Secondary	1	—	1
(*c*) Tertiary	13	1	16
(*d*) Congenital	—	—	—
Tetanus	—	—	—
Trypanosoma Fever	3	1	3
Tubercle—	22	4	24
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	1	—	1
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	49	2	49
Circulatory System	21	7	22
(*a*) Valvular Disease of Heart	—	—	—
(*b*) Other Diseases	—	—	—
Digestive System—	73	7	76
(*a*) Diarrhœa	35	5	35
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	7	—	8
Congestion of Liver	2	—	2
(*d*) Abscess of Liver	1	—	1
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	2	1	2
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	2	—	2
Eye	21	—	21
Generative System—	—	—	—
Male Organs	99	4	104
Female Organs	32	2	32
Lymphatic System	13	—	13
Mental Diseases	4	2	4
Nervous System	51	14	48
Nose	2	—	2
Organs of Locomotion	6	—	8
Respiratory System	72	15	108
Skin—	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	2	—	2
(*f*) Other Diseases	114	1	119
Urinary System	24	13	28
Injuries, General, Local—	118	4	119
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	—	—	—
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	3	—	3
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	2	—	2
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	205	—	209
Amputations, Major	10	—	11
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	1	—	1
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	1	—	1

Nature of subject examined	Results	Remarks
Fæces — *Anchylostomum duodenale*	6 ...	
,, *Amœba coli*	15 ...	
,, *Lambia intestinalis* ...	1 ...	
,, *Balantidium coli* ...	2 ...	
,, negative and other common ova ...	22 ...	
Night-blood films for Dr. Prout, Liverpool School	100 ...	Results not known.

A Table of the "Malarial Index" of the more important towns in the Colony is given at the end of these Reports. The splenic enlargement was taken as the indication, and in the large proportion of the bloods examined of the same cases the sub-tertian malarial parasite (ring forms only) were invariably found.

The total number of out-patients for the year is 27,474, or an increase of 5,875 over the number for 1908. This return gives the most striking proof of the expansion of the Hospital work, and it is only fair to suppose that, had the accommodation been available, the number of intern patients would have increased in direct proportion.

The following list of out-patients treated during the past ten years speaks for itself:—

1900, 7,653; 1901, 7,864; 1902, 9,321; 1903, records missing; 1904, 9,938; 1905, 8,374; 1906, 15,257; 1907, 18,008; 1908, 21,599; 1909, 27,474.

General Conclusions.—It will be now patent to those who read that the work of the Hospital in the year under review has increased in every direction. It is still more so to the working staff of the Hospital, whose resources and time have been taxed to the utmost to attain this level. Apart from the actual practice of medicine and surgery, there are other duties which are lost sight of by the public, in the management of an institution of the pretensions of the Colonial Hospital. We have a large staff of untrained material to deal with, and their instruction, both practical and theoretical, forms part of the duties of the Hospital staff. The examinations for their admission and promotion to higher grades, held twice a year, occupy considerable time and labour. The druggist examination has been ruled to form part of the "expected" duties of the medical officers; the examination of candidates for Government service, such as the police, post office, boatmen, and warders also takes time. In a large community like Freetown lunacy is a serious item, and examination of lunatics is necessarily a tedious and trying ordeal. It frequently happens that two medical officers are in attendance at either the supreme or police court together; their work at the Hospital is therefore at a standstill during the most busy time of the day. One medical officer is also "Medical Officer" of Prisons, and he is liable to be called up at any hour, in addition to his routine duties in the Hospital, and in the Prison Infirmary. One medical officer is generally engaged for two or three months, according as he can spare the time, on the annual Board of Survey on the medical institutions of the Colony. Two medical officers are constantly on emergency duty for midwifery cases and casualties at any hour of the day or night, in addition to the urgent calls to cases actually in their own wards or at the houses of Government officials. The administration of the Hospital, and the scrutiny of the various books concerned, is no light task, and finally the extra work thrown on the other two, when one of the three is ill, robs all other work of professional pleasure.

I have represented these matters at length, and, though wishing to make no invidious comparisons, cannot refrain from stating that the amount of work done, and the responsibilities placed on medical officers attached to the Hospital, are out of all proportion to the individual work which medical officers in more favoured hospitals and institutions, not necessarily in Sierra Leone, are called upon to perform. The experience gained is invaluable, but the overtaxing of energy is detrimental to both mind and body, and we may justly claim that we have demonstrated to the last degree the working possibilities of the Hospital during the year 1909.

Report of the King-Harman Maternity Ward of the Colonial Hospital for the Year 1909.

During the year ninety-seven patients were admitted for treatment.

The number of admissions into the wards during the year was larger than at any other period, and this, in my opinion, was largely due to the fact that we had continuously in charge a responsible European matron, thereby maintaining the confidence of the people in the institution.

Admissions during the past eight years were: 1902, 47; 1903, 29; 1904, 61; 1905, 74; 1906, 46; 1907, 60; 1908, 57; 1909, 97; total, 471.

Puerperal fever is one of the principal causes of death among the creole population of the Colony, but it is infrequent among the aborigines. It is due to the following causes: (*a*) The use by the lower classes of any sort of rags that might have been kept for months during the period of pregnancy to be used on the day of parturition. (*b*) The attendance of ignorant practising druggists and half-educated creole grannies or midwives, who are largely patronized by the people, and in my opinion constitute an even more potent source of infection, in that, with a view of showing and impressing upon the relatives of their patients their knowledge as well as of inspiring confidence, these druggists and grannies make frequent vaginal examination with unclean hands, and even when a pretence is made of washing their hands this is done insufficiently. Infection is also conveyed by some of them by means of instruments such as syringes and forceps, which some of the druggists and others use, and which may not be thoroughly sterilized and rendered aseptic.

Among the aborigines puerperal fever is far from being common, in fact it is rare. The old women in attending to their patients do not make any vaginal examination at any period during the stage of parturition; their examination is wholly carried out on the external abdominal surface, and therefore they do not convey sepsis by their hands per vaginam.

Among the Timnes, Mendis and other tribes

labour is conducted outside the house; the patient is taken to the Bundo bush or sacred grove, not far from the village or fakai, which is carefully cleared of bush, swept and rubbed and whereon a new mat is laid for her use. Here the head of the Bundo women, an old woman who must be a mother herself, attends to the patient, and everything connected with the labour takes place. After labour is over the patient is bathed with native herbs already prepared, after which she leaves the bush and returns home to her friends to commence her daily duties. This generally happens on the same day, or within twenty-four hours after delivery. Thus, from first to last the patient runs no risk of suffering from puerperal fever.

The gynæcological section of the King-Harman ward has increased in the number of attendances during the year, and this is due to the fact that the people were encouraged to attend and were specially looked after. In the 'eighties the Colonial Hospital had a very large gynæcological practice, which was under the immediate charge of the late-lamented Dr. Hume Hart, Colonial Surgeon. On his decease the attendance as a special section of the Hospital entirely fell away, and there was no public institution where the poor women of Freetown could obtain regular attendance. This was given by the general practitioners at their houses, but not satisfactorily. On the opening of the Princess Christian Cottage Hospital, now called the Princess Christian Mission Hospital, women of all classes flocked there for treatment, and that institution had the monopoly of these cases. After the opening of our King-Harman ward, the executive officer did not encourage the creation of this special department, owing to the increase of Government officers in every department of the service, and the consequent increasing demands made upon the time of the two medical officers stationed at Freetown beside himself. Notwithstanding this, a large number of cases were seen and treated among others in the Out-patients' Department.

During the year under review this section of the work has been better organized and received greater attention, owing to the fact that the number of medical officers temporarily resident in Freetown was increased from two to three.

Although all cases are seen and attended to daily in the Out-patients' Department, yet the medical officer in charge of King-Harman ward sees and treats apart, on Tuesdays and Fridays, all patients suffering from diseases peculiar to women. This has served to induce and encourage the shy and delicate to attend for treatment, and been a means of increasing the number of attendances.

It is indeed very surprising to see the large number of women of all classes, especially among the creoles, now coming up for treatment who are suffering from subinvolution, endometritis, fibroid growth, salpingitis, ovarian tumour, uterine polypus, gonorrhœa, disorders of menstruation and other conditions, which is itself a manifestation of confidence by the people in this branch of hospital work.

To enable the medical officer in charge to cope with this increasing class of cases, and to give the much sought for relief, it is necessary that the equipment available for use should be increased, and every facility given for the vigorous prosecution of the work. From a humanitarian and social point of view this is urgently necessary, for there has been occurring for several years among the descendants of the liberated Africans and original settlers an increasing death-rate, a falling birth-rate, a diminution in the number of families among the married people, and an increase in sterility. The increase of the population of the Colony proper is not among these two sections, but is due to the large influx of the aborigines, Mendis and Temnes, who are becoming residents in the villages and towns.

It is proposed to open a special Out-patients' Registration of Diseases Book, which would enable more accurate statistics to be kept of the diseases treated, and show the amount of work done in this particular branch.

Nursing Home.

There were fifty cases admitted during the year, an increase of eight over the previous year.

The number of patients treated during the past seven years, with the number of deaths, was as follows:—

	1903	1904	1905	1906	1907	1908	1909
Cases ...	76	90	79	59	66	42	50
Deaths ...	nil	nil	3	2	4	3	1

The patients were derived from the following classes:—

Government employés	Railway Department	10	13
	Other officials ...	3	
Commercial firms			23
Shipping			9
Missionaries			3
No occupation			2
			50

The diseases met with were as follows: Alcoholism (delirium tremens), 1; blackwater fever, 4; carbuncle, 1; debility, 1; dysentery, 2; enteric fever, 1; fracture (of arm), 1; hernia (scrotal), 1; gastritis, 2; gunshot wound, 1; insolation, 1; lachrymal fistula, 1; malarial fever (exclusive of blackwater fever), 29; neurasthenia, 1; pleurisy, 1; ptomaine poisoning, 1; whitlow, 1. There was one death due to blackwater fever.

It will be seen that the firms and shipping contribute well over half the number of patients treated in the Home, Government officials a little over a third of the number. The latter are chiefly second-class railway employees, platelayers, drivers, fitters, &c., their illnesses being, in the majority of cases, due to greater exposure and more irregular habits of living than others. During the year the European Nursing Staff had some very arduous times as it frequently happened that several critical cases were admitted about the same dates, but I am pleased to report that they at all times performed their duties cheerfully and efficiently, and to the satisfaction of all concerned.

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The Jail.

The daily routine has been carried out as in former years. The average number of prisoners both male and female was 209. During the quarter ending June 30, there was a slight epidemic of beriberi, which attacked six prisoners; four died of the disease and two recovered.

Owing to a prisoner being sent from an outstation, namely, Waterloo, and developing chickenpox during his stay, two of his cell companions were infected with the disease.

These were the only epidemics that occurred during the year.

A number of prisoners are suffering from diseased hearts and therefore are only able to do light labour.

Ten deaths occurred during the year from the following diseases: Beriberi, 4; heart disease, 2; strangulated intestine "volvulus," 1; tuberculosis, 2; general debility, 1.

Eleven executions took place; the great number of the condemned prisoners were sent from the Protectorate.

The general sanitary condition of the jail, such as cells, compounds, &c., has been kept up to the standard of former years, the jail compounds, quarters for warders, and yards have been kept scrupulously clean.

During December quarter the cells and outbuildings have been whitewashed.

The chief diseases treated were: Dysentery, beriberi and heart diseases.

The food supplied by the contractor on the whole has been good, and the water supply is also good.

The attendants' and warders' health has been good, very few have been ill.

A temporary block of cells has been built on a new site at the western end of the town, on which a new permanent prison is to be built. It is now occupied by over 100 prisoners and thereby has greatly relieved the old prison, which lately has been at times dangerously overcrowded.

J. S. Pearson.

Kissy Institutions.

Lunatic Asylum.—There were 113 inmates at the beginning of the year and thirty admissions during 1909, a total of 143 under treatment. Of these, seven were relieved and discharged to the care of their friends, one not relieved was transferred to the West Indies, and twenty-six deaths occurred, leaving a total of 109 at the end of the year. From the number of admissions it will be seen that there was an increase of five above the previous year. Four patients were placed under observation, but as they exhibited no mental trouble were discharged. There was no case of accident during the year; only one instance of cruelty by a female attendant, to an inmate, occurred; this was brought to the notice of the Principal Medical Officer and the attendant was suitably punished. None of the inmates absconded during the year; I attribute this to the great care exercised by the staff.

One case of trypanosomiasis was admitted, the cervical glands were enlarged and there was found no puncture to certain trypanosoma, bodily condition on admission was very poor and the patient died a few weeks after. The remainder of the deaths were due to epileptic exhaustion, pulmonary tuberculosis, general dropsy, asthenia, angina pectoris, anæmia, exhaustion, strangulated hernia, phthisis, intestinal obstruction, enteritis, paralysis of the insane, paralytic exhaustion, apoplexy, dysentery and Bright's disease.

A number of male lunatics, who are lucid and physically fitted, are employed in attending to the vegetable garden and do sanitary work. All rubbish heaps are removed and the rubbish disposed of by burning or burial, excreta being dealt with in a trenching ground in a suitable site outside the buildings. The female lunatics who are mentally fitted do the washing and mending of the clothes of the patients in the asylum.

Both male and female lunatics are always in charge of reliable attendants.

Female Incurable Hospital.—At the beginning of the year there were thirty-six patients, fifty-one were admitted during the year and forty discharged, and there were eighteen deaths, due chiefly to exhaustion, old age, and syphilis. This hospital is very old and requires reconstruction. A nurse is in charge of the inmates and the general cleaning and sanitary work is done by two labourers.

The Garden.—During the year the garden was not very profitable, owing to insects destroying the plants.

Vegetables sold amounted to £4 9s. 1d., as against £7 19s. 6d. the previous year.

Male Incurable Hospital.—This old building was occupied by seventy-eight patients during the year, there were seventy-five admissions, the total number of deaths was 45, chiefly from old age, syphilis, paralysis and exhaustion. Thirty-seven patients were discharged, seventy-one remaining in hospital.

There were six lepers at the beginning of the year and two admissions during 1909, making a total of eight under treatment. The varieties are: Nodular form, 4; anæsthetic form, 4.

Lazaretto.—During the year thirty Kroo boys were admitted and placed under observation for seven days owing to an outbreak of small-pox on board the s.s. "Addah." No outbreak of the disease occurred during their detention. I attribute this to the prompt and energetic measures adopted by the Principal Medical Officer in sending the Public Vaccinator to vaccinate the whole of the Kroomen, and special constables on duty at the Lazaretto, and which have had such satisfactory results.

The whole of the men were vaccinated successfully.

Small-pox Hospital.—During the year there were eleven cases of chicken-pox and one of small-pox admitted. There were no deaths, all discharged cured.

Vaccination.—During the year under review 157 children were vaccinated, 127 successful, nineteen unsuccessful, eleven not seen.

Dispensaries.—During the year there were 1,445 out-patients seen at the Kissy Dispensary, as against 1,223 the previous year; subsequent attendances coming up to 1,298.

Six hundred and forty out-patients were seen at the Wellington Dispensary, as against 517 the previous year; subsequent attendances coming up to 540. The prevailing diseases were rheumatism, constipation, ulcers, bronchitis, diarrhœa, and malarial fever (benign tertian).

Both at Kissy and Wellington there has been a marked increase of attendances, but unfortunately the people are very poor and most of them can ill afford to pay the small fee of 3d. The amount collected during the year is £2 5s. 3d.

Sanitary Conditions of Wellington Village.—The sanitary condition of this village is exactly as it has been for years, no improvement has taken place. No attention is paid to sanitation, neither in dwellings nor their surroundings, conditions that to the intelligent mind should be pregnant factors in causing and disseminating disease. In the interest of the public safety I would suggest that the headman be asked to see that the village is kept clean. The sanitary condition of the village leaves a lot to be desired, and to this state of affairs the headman's attention might be drawn.

The total number of attendances of all classes of Government officials residing at Cline Town, Kissy and Wellington during the year are as follows: Europeans, 51; natives, 86; total, 137.

Six European officials of the Sierra Leone Government Railway were sent to the Nursing Home, Freetown, during the year: One for intermittent fever (benign tertian); one for septic wound of thumb; one for phthisis; one for diarrhœa and debility; one for pleurisy; one for blackwater fever.

Cline Town.—I would respectfully submit for your kind consideration the work at Cline Town, which is increasing year by year; at present there are not less than twenty-one European officials of the Sierra Leone Government Railway residing there, besides several native officials with their families; for the safety of their lives in urgent cases demanding immediate medical attendance it is necessary that a medical officer should reside at Clines. The present arrangement, whereby the medical officer at Kissy is made responsible for the health of the officials at Cline Town, involves a good deal of risk and delay in treatment owing to the distance between Kissy and Clines. Further, the medical officer at Kissy may be engaged in such duties as would prevent him from responding to urgent calls from Cline Town, or he may be on duty at Wellington, or attending Coroner's inquests in any part of the district.

W. F. Campbell.

Sherbro.

The health of the European officials has been good. The health of the native officials has not been as good as last year. The attendances for treatment numbered 210, as against 140 last year, or an excess of 70.

Non-Official Europeans.—On an average about twenty-five Europeans are employed by the mercantile firms here, and on the whole they enjoy good health considering the time they are kept in this country. One of the white assistants died up river in the early part of the year from sequelæ of extravasation of urine.

Hospital Buildings.—The hospital buildings have been kept in a fair state of repair during the year, with the exception of the dispenser's quarters, which are in a rather dilapidated state. The provision of a detached ward, connected with the main building by a covered way, is necessary owing to the number of cases of a syphilitic nature presenting themselves. The capacity of the reservoir has also proved inadequate this year owing to the foundations of the same being carelessly laid. It would be well were a well sunk in the hospital compound as a source of reserve supply.

Operations.—There were nine operations performed during the year under review as follows: Amputation of elephantoid scrotum, 2; reduction of a dislocated wrist, 1; scraping a tuberculous gland, 1; radical cure of inguinal hernia, 2; removal of epilus, 1; amputation of leg for syphilitic ostitis, 1; amputation of middle finger of left hand, 1.

There were no deaths resulting therefrom.

In-patients.—There were 232 admissions of in-patients during the year, *i.e.*, 47 in excess of last year.

Out-patients.—The out-patients numbered 2,652, or 157 more than last year, with old cases.

Deaths.—There were ten deaths in hospital, classified as follows: Tubercle, 2; unclassified, 2; digestive system, 2; circulatory system, 1; nervous system, 1; connective tissue, 1; parturition, 1.

No cases were admitted to Small-pox Hospital during the year.

Epidemics.—With the exception of a mild epidemic of whooping-cough during the latter part of the year, there have been no epidemics. 102 cases of the above disease sought treatment.

Vaccination.—During the course of the year 1,289 vaccinations were performed, of which 1,285 proved successful. A particularly good record, I consider.

The Jail.—The yard and cells of the jail are kept clean, but, as in former years, the cell accommodation proved totally inadequate at times. Bi-weekly visits are paid.

Official Visits.—His Excellency the Acting Governor visited the hospital on November 30, and the Bishop of Sierra Leone on September 4, the Principal Medical Officer visited the hospital on May 18, 1909.

Sanitation.—The sanitation of the town is attended to by the Port of Sherbro Municipal Board, and on the whole they keep the town fairly clean, though lately I have noticed a laxity on the part of the official inspectors.

All meat is inspected by the Medical Officer both before and after slaughter.

Hospital Fees.—Hospital fees totalled £33 9s. 3d., or an increase of £8 10s. 2d. over last year.

J. F. WARD.

Protectorate District Reports.

KARENE DISTRICT.

Headquarters—Batkanu.

The headquarters are situated near the River Mabole on rising ground surrounded to a varying extent by swampy ground according to the season of the year, *i.e.*, wet and dry season; mosquitoes and tsetse flies abound more or less throughout the year. Owing to the configuration of the country in the immediate neighbourhood, the current of the river is very sluggish, hence the tendency in the rainy season to the overflowing of its banks and the formation of swampy areas with stagnant pools. The question of the prevention of these pools is a difficult one to solve, and it would certainly be an extensive undertaking. There has been a fairly large area of bush clearing done lately with marked benefit in the way of lessening the number of mosquitoes and tsetse flies which were formerly more numerous. A continued clearing of bush around the station has been arranged for with the Chief, together with the ordinary sanitary measures as regards the cleaning of compounds and removal of rubbish, &c.

The water supply is very unsatisfactory, being obtained from the river, which is known to be liable to contamination by the neighbouring towns and villages; however, all precautions as to purification by filtering, boiling, &c., are invariably taken by the Europeans who have to use it. A new prison has been built at Batkanu during the past year, which is a well-built and well-contrived building, containing the usual cell and out-office accommodation.

The court messengers' barracks and prison are inspected weekly, and are kept in a fairly good sanitary condition. The hospital and dispensary building is in good condition. There were only five in-patients treated during the year, with one death, due to pyæmia; this small number is accounted for by the sparsely populated country around the station. There were 1,110 out-patients treated, being 189 more than the previous year.

There have been no cases of serious illness among the seven Europeans who were resident for varying periods during the year, and only a few mild attacks of fever were recorded.

The court messengers, prison warders, &c., have suffered from the usual troubles of natives to a lesser degree owing to their more regular life and healthier surroundings. Foot sores in the rainy season, and respiratory diseases, especially in the Harmattan season, are the principal diseases suffered from. Rheumatic pains are also fairly common.

The sum collected from out-patients was £8 5s. 9d. Medical comforts sold, £2 3s. 7d. Total receipts, £10 9s. 4d.

Number of Europeans on sick list, 1; native admissions on sick list, 60.

The chief diseases of the district are rheumatism, respiratory diseases, syphilis.

Only three cases of leprosy were reported in the district. No case of trypanosomiasis was met with during the year, but the neighbourhood of Batkanu is full of tsetse flies, and the whole district appears to be a suitable place for their increase. Owing to the large area of the district, approximately 7,500 square miles, and the fact that the Medical Officer has to remain at Headquarters in order to perform administrative duties (Deputy District Commissioner) for nearly six out of the twelve months, it is impossible for him to visit more than a small portion of the District during a tour. The country is full of rivers, and all those I know, as a result of my patrols, are infested with tsetse flies, a large number of which I have collected and sent to the British Museum and other places. I hope that the much-needed clearance of bush around at least the main ferries will soon be taken in hand according to the instructions issued by the District Commissioner on my advice.

There were 303 successful vaccinations performed during the year; these were the cases actually inspected after vaccination, but owing to a large number not coming in for inspection probably a much larger number were successful, as the lymph supplied was of excellent quality, and more persons would have been vaccinated; but owing to the performance of administrative duties at Headquarters, as already stated, I was unable to patrol the District for this as well as other purposes.

J. C. MURPHY.

RONIETTA DISTRICT.

Headquarters—Moyamba.

Moyamba is situated on the railway line 76 miles from Freetown. The District now includes the Timne portion of the Central District (abolished), although administered by an Assistant District Commissioner. The duties of the Moyamba Medical Officer include aid to all railway officials from Songo to Bo, a distance of about 100 miles, including the tram lines.

European Officials.—Average number was 9. The number on sick list was 6, with an average of 3½ days; this is quite a satisfactory record.

Native Officials.—Number on sick list was 25, with an average of 9 days, also satisfactory.

Deaths.—There were none during the year amongst officials, or any serious sickness necessitating invaliding.

Out-patients are recorded at 3,563, in comparison to 2,008 in the previous year.

In-patients as 38, in comparison to 16 in 1908.

The principal ailments complained of by the out-patients were malaria, rheumatism, worms, constipation, ulcers, diarrhœa, bronchitis, and vague pains.

It has been said that a nominal charge for medi-

cines in the dispensary would lessen attendance; this in my experience is incorrect, and is not borne out by statistics. It has been my principle to request some payment, except when there is evidence of visible poverty, in order to imbue the natives with a spirit of independence and self-reliance; very few of the hinterland natives cannot afford threepence to a shilling for medicines; it is only too often cropping up that extortionate fees are paid to the cunning native quack.

Hospital Compound.—About 1½ acres in area, is situated on the right-hand side of the main road to the town, opposite the jail and adjoining the Court Messengers' new barracks; it contains two hospitals, mortuary, kitchen, and latrine house. The Government hospital is a wooden structure, roofed with corrugated iron, divided into a ward capable of holding four beds, medicine room, store, and consulting room. This building is raised about two feet off the ground, and, as a hospital, is not viewed with favour by the native community owing to the thermic changes—scorchingly hot and stuffy in the day time and chilly during the early hours of morning. Under such circumstances this type of hospital is not a success, even the drugs are subjected to the same variation of temperature. The second hospital is of a round native type, capable of holding comfortably six beds; it was built and presented by the sub-chiefs of Moyamba to myself, as a recognition of services rendered to their people for sugicial work done after my arrival here. It is the only instance I have known of native gratitude to be shown in this manner. This hospital has been of great aid in the treatment of post operation cases; it is easily kept clean, inexpensive, not subjected to great variation of temperature, and as near as possible resembles their own dwellings; in fact, it meets the present requirements of bush surgery.

Operations.—The number of operations performed was fifty-two, of which twenty were major; this includes eighteen scrotal elephantoid tumours. The tumours varied from 20 to 110 oz., and four were complicated by hernia. There were four deaths following these operations, one from shock, one from alcoholic liver and spleen, two from mental derangements. The mental symptoms began in one six days after operation, with hallucinations, twitchings, and muscular spasms, in the other case symptoms appeared four weeks after in the form of melancholia; in both cases the testicles were left intact.

I am of opinion that great services could be rendered to the Protectorate tribes by erecting a central hospital or hospitals for surgical work, thereby benefiting a class of deserving primitive people, capable of showing gratitude.

European Officials' Quarters.—That of the District Commission is overlooking the railway station and town on a favourable site. The barrack-like quarters, formerly occupied by officers of the Frontier Force, is now utilized by the Assistant-District Commissioner and Medical Officer, with the central rooms as a rest house.

This building has been condemned for some years past and is in great need of repairs. Owing to the position of site, unprotected verandahs, heavy and damp sub-soil, I consider it one of the most unhealthy quarters in the Protectorate.

The quarters occupied by the European Staff of the Sierra Leone Government Railway have nothing special to recommend them. The question of better accommodation for European officials at Moyamba deserves the Government's attention.

Rest House.—The fact that this rest house is situated between residential quarters, with common verandahs, is scarcely fair to those stationed there. It excludes privacy, and has, during my time, been the cause of looting by strange carriers entering what might be termed a private compound. This arrangement has other drawbacks.

Barracks.—Messengers' quarters. In consequence of unfavourable surroundings and overcrowding, a new barracks on the opposite side of the main road has been erected. The site and type of houses are satisfactory.

Water Supply.—The town has a plentiful supply, which is very liable to contamination owing to dwellings and the habits of the Mendi people. This supply is used by all except the European staff and hospital.

The latter received a daily supply from a mountain spring about three miles from town; it is conveyed in aluminium jars and affords an excellent supply of pure water. This arrangement came into force about six months ago. This water is distributed for the most part by prison labour, and when the Government can afford to lay pipes a great boon will be conferred on the entire community.

Sanitation.—The pail system is in force in the European and Sierra Leone Officials' quarters and works well. The native town, with the exception of a few sunk closets, has no system. Sanitation in the Government lines is carried out by the prisoners, whose duties this year have been exceptionally heavy owing to blasting operations for the new gaol.

Moyamba Town had been allowed to become greatly neglected, presumably due to the fact that the paramount chief is a chronic invalid; all animals were permitted to roam about and work great havoc in the town, gutters unkept, refuse deposited within the town, and no clearing of bush around it. After a period of six months' persistency I have endeavoured to stimulate the sub-chiefs into activity; all the animals have been dealt with, old gutters closed or repaired and new ones made, the streets have been seen to, all refuse removed and burnt, clearing of bush around the town for a distance ranging from thirty to sixty yards has just been completed; also a road 6 ft. wide has been constructed on the outskirts of the clearing; this road enables the inhabitants to walk round the entire town. They have promised to fulfil health requirements by allowing no refuse or dirt to remain within this circular road.

His Excellency the Acting Governor has kindly promised twelve sanitary bins in order that all refuse may be cleared from within and burnt or destroyed at convenient centres.

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I am convinced that with a little supervision and encouragement, Moyamba in a short time will be a creditable Mendi town. At first some of the residents brought forward objections, which, after explanations, were overruled by the sub-chiefs; and now the people are glad and realize the great benefits derived from this sanitary scheme. Undoubtedly the native mind is conservative, but one is struck by their practical minds and quickness to grasp an idea or scheme which will benefit them.

Burial Grounds.—I pointed out the unhealthy atmosphere produced by graves in near proximity to dwellings; this they admitted, and have carried out the sanitary scheme even in these areas. They have also promised to bury their dead at greater distances from habitations, and as long as the sanitary belt and circular road remain it will be an easy matter to carry out.

Vaccination.—During the year 811 persons have been vaccinated, 728 successfully; this excellent result is due to active lymph and careful preparation and scratchings.

Sanitary Reports.—Four have been forwarded by me to Freetown. They covered a fairly wide portion of this district, and briefly the procedure was as follows: In the town Barri, in the presence of the chief and as many of the people as possible, I lectured in simple language for a period of half to three-quarters of an hour on sanitation, vaccination, general sickness, leprosy (isolation), elephantiasis operations, blood-sucking flies, and disease.

Then followed a tour of inspection of the entire town, pointing out sources of sickness and issuing all possible suggestions for the benefit of town and people.

I am convinced that this is the best policy to ensure success, and the more people who hear what the Government doctor has to suggest for their health, the better probably will be the results.

In conclusion, it would be hard to estimate the enormous benefit to these primitive inhabitants by the successful carrying out of the Government sanitary scheme, a unique opportunity for the West African Medical Staff officers, in conjunction with the District Commissioners.

I discovered a singular abnormality in an elephantiasis scroti, namely, two testicles firmly adhered together and both cords passing up through the right inguinal canal, and in a second patient *ante-mortem* decomposition in spleen with scirrhotic liver, in twenty-four hours after operation for elephantiasis scroti.

J. JACKSON-MOORE.

KOINADUGA DISTRICT.

Headquarters—Kaballa.

The health of the officials has been very good, none of the European officials being placed on the sick list; with the exception of one ex-Court messenger, who died of heart disease, after leaving the hospital against the medical officer's wishes, there was no serious illness amongst the native officials.

A large number of patrols have been undertaken for the purposes of vaccination, leprosy investigation, and attending to the general sanitation of the towns. There is no doubt that the greater cleanliness of many of the larger towns is due to these patrols.

There were 443 vaccinations performed, but 329 were not seen a second time; still, as there were only three unsuccessful cases amongst the 114 cases seen a second time, one naturally supposes that there were over 400 successful. This number is only about one-tenth of the number that should be vaccinated yearly, except that the district is, owing to the appalling epidemics of from four to six years ago, more protected than other districts in the Protectorate. Coming from the Mendi or Timne country one notices what a much greater proportion of Kurankos, Limbas, and Yalunkas are pock-marked. The longer dry season, accompanied by stronger winds, is probably a cause of greater frequency of small-pox in this district than in the country near the sea. However, apparently, no cases have occurred in the district during the past three years.

One case of sleeping sickness was observed, and though tsetse flies are common, bites from these are apparently innocuous. Leprosy is freely prevalent, but these have been dealt with recently in a report from Dr. Orpen.

Referring now to Kalabia, the headquarters of the district, the chief item of interest is the removal in November of the Company of the West African Frontier Force to the Moa River. This was mostly brought about by the difficulty in feeding an alien population of over 300 in a country which is not thickly settled, which produces little rice and no palm oil. The latter, largely used as a food necessary, of valuable anti-scorbutic power, has to be imported from the Timne country.

The water supply, always one of the best in the Protectorate, has been further improved by fences and surface drains which have been cut on the ground level.

A slaughter-house and meat barri, with inspection by the Medical Officer, are innovations of this past year. This has prevented the old noxious plan of slaughtering animals on ground often highly contaminated, and the keeping of the carcase in an ordinary dwelling house. It has largely contributed to the abatement of the fly nuisance. Another reason for fewer flies is that in Kaballa, as well as in several of the other large towns, the people are beginning to realize that proper cow-sheds, erected at some distance from the town, are better than the old plan of tethering the cows in the main streets. This, however, is still the custom in all the smaller towns.

Hospital and Dispensary.—These are situated between the clerks' houses and the barracks, and since the latter have been untenanted it is difficult to get sick persons to come into hospital.

The in-patients numbered fifty-seven during the year, an increase of six over the previous year, the

only death being the case of *Trypanosomiasis*, already referred to. The out-patients numbered 968, a decrease of 455 over the previous year; this is partly due to the better health of the "Frontiers," but also to the fact that the native town of Kaballa has been throughout the year about half the size as formerly, the Kurankos who occupied this portion of the Limba country having gone back to the place from which they originally came. Amongst the non-officials an increase of over 100 per cent. in subsequent attendances tends to show that the natives are becoming more appreciative of European treatment.

Meteorological observations have been kept throughout the year; the highest maximum shade temperature registered was 99° F. in February, and the lowest minimum of 40° F. in January. The average "Relative Humidity" at 5 p.m. was 81.6 per cent., this is probably too high, owing to the wet bulb not being properly adjusted. The rainfall of 135.2 in. was quite 30 in. above the annual average.

C. H. ALLAN.

RAILWAY DISTRICT.—STATIONS—DARU AND KENNEMA.

Daru.—Headquarters of the W.A.F.F.

Attendance at Hospital.—Out-patients, 1,522, including 780 subsequent attendances during the year.

In-patients.—137, with two deaths, due to pneumonia and pulmonary tuberculosis respectively; both patients were Frontiers. On the whole the health of the troops has been fairly good; the greater number of cases treated in the Out-patients' Department and in Hospital being due to intermittent fever, rheumatism, gonorrhœa, digestive disorders and minor wounds.

Hospital Accommodation.—The present native structure suffered severely during the past rainy season; on two occasions it was uprooted in the middle of the night and the patients drenched in their beds. As new barracks are at present being erected for the reception of two more companies of 100 men each, the present condition of affairs will become impossible unless a start is made shortly with the proposed permanent building.

Health of Officials.—This has not been particularly good, due I think to the excessive prolonged and severe rainy season; eight European and four native officials were placed on the sick list for a total period of eighty-five and forty-eight days respectively. One European officer was invalided home three weeks before the end of his tour suffering from malarial fever.

Vaccination and Small-pox.—No cases of small-pox were observed throughout the year; 253 persons were vaccinated. The lymph was always of good quality.

Sanitation of Barracks.—This has been satisfactorily attended to, the men's latrines regularly inspected, non-combustible rubbish disposed of in pits, and bush undergrowth well cleared. Two cesspits (condemned as insanitary by the P.M.O. on his visit of inspection) formerly in use by the officers have just been done away with and four pail closets substituted; these are emptied twice daily and disposed of for the present in the men's cesspit, but a small pier is to be built into the river at a suitable spot to enable the sanitary gang to empty the pails directly into a strong current.

The *Water Supply* has been satisfactory throughout the year.

KENNEMA.

Health of Officials.—There was no case of sickness among European officials during the year; there was no case of serious illness among native officials, but there was a good deal of anæmia and debility arising from the extraordinary difficulty of obtaining fresh food of any description during the greater part of the year. One court messenger was invalided suffering from hemiplegia.

Water Supply.—Excellent. Pipes have been laid on to the District Commissioner's bungalows, the gaol, clerks' and court messengers' quarters.

Gaol.—The new stone gaol has been completed, with accommodation for fifty prisoners. Kitchen, bath and lavatory arrangements are all satisfactory. Two deaths occurred, one from dysentery and the other from peritonitis. Altogether 478 cases were treated, mostly of minor ailments which would never have been reported had not the patients been in confinement at the time. No epidemic occurred during the year; sanitary precautions were carefully and regularly attended to.

Attendances at Hospital.—2,203, including subsequent attendances and those from the gaol.

Scarcity of Fresh Food.—Considering the size and importance of Kennema it is difficult to explain the famine-like conditions that obtain there at all times of the year. Two native officials have assured me that for two days they could obtain no fresh food except cassava leaves. Once, it is true, three cows were killed in quick succession. The dispenser's suspicions were aroused, and he informed me that when he inspected the third cow it was a mass of disease. Acting on his information I drew up a set of regulations to be observed in future slaughterings, but matters immediately relapsed into their old groove.

W. A. ALEXANDER.

STATION BO.

The number of officials in and about Bo is: Europeans, 13; Sierra Leoneans, 44; natives, 209; and schoolboys, 110; a total of 376. The health has been good, only 130 days being lost through sickness by the permanent staff.

Out-patients.—The number of out-patients for the year was 1,158, an increase of 318 over last year.

In-patients.—The in-patients numbered fifty-two, being twenty-four less than last year; there was one death from perforation of the intestine.

Hospital Accommodation.—The hospital accommodation is still very poor, there being only one mud native house, which is very dark and has seven wooden beds. The patients have to bring their own beds, clothes and food, and also somebody to cook for them. These conditions are a deterrent to most natives, especially the poorer ones, from obtaining hospital treatment.

Operations.—There were ten operations under chloroform, these included: Inguinal hernia (radical cure), 3; elephantiasis scroti, 1; dilatation of urethra, 1; circumcisions, 2; opening abscess, 2; tapping bladder suprapubically, 1; dermoid cyst removal under local anæsthesia, 1.

A portion of the dispensary, a wood and iron building, has two iron beds in it, which were sent here to form a ward for Europeans, but as there is no latrine or kitchen, or any provision made for feeding the patients, it is obviously unsuitable as a hospital, even leaving out of account the fact that it is the only place where the surgical instruments, dressings, poisons and books can be stored, and also that it is used for the clerical work of the dispensary.

Professor Simpson, accompanied by Dr. Kennan, paid a visit to Bo, and was not very favourably impressed with the bungalows of the officials and the water supply. The bungalows, he says in his report, are unfit for human habitation, much of the flooring and joists of the houses have dry rot and need repairing. The water supply is still very bad; the tanks, with a total capacity of 10,600 gallons, now that the Railway Department have supplied each of the houses occupied by railway officials with a tank, are obviously inadequate for the use of the officials, especially as the trading firms have also a right to be supplied with water by the Government. To increase the supply of water, eighty aluminium water carriers of 5 gallons capacity have been sent here, and during the dry season they are to be sent to Kennema by train to be filled with water and returned to Bo. This will be done three times a week for perhaps three months, and will no doubt be expensive. The sanitary arrangements here consist of outside earth closets, which are emptied every night in a trenching ground near the railway. There is a sanitary gang of eleven men and one headman, who empty the latrines and keep the European compound clean.

The sanitary inspector and carpenter were dismissed at the latter end of the year, on the recommendation of His Excellency the Acting Governor, as being a needless expense.

The children at the Bo school are healthy, and are increasing in numbers. Their houses in their own compound are too near the European quarters, being much less than 200 yards from the nearest European official's house. The children obtain their water from a well at the head of a swamp, and if the coming dry season be prolonged, I doubt if the supply will be large enough for their needs. They have two swimming baths, built in the line of the bed of the swamp.

Vaccination.—Has been carried out diligently, the total number vaccinated in the year being 1,221. The natives round about Bo seem to be a little less afraid of vaccination, and to realize its object and benefit.

Meteorological Observations.—The total rainfall for the year has been 119.27 in.: the rainiest months being August, June and July. The highest recorded temperature by the shade thermometers was 99.2° in March, the lowest 59.2° in December. The mean maximum shade temperature for the year was 88.2°. Flies have been sent to both the British Museum and the London School of Tropical Medicine.

H. E. ARBUCKLE.

WULADE AND KANRE-LAHUN, W.A.F.F., OUT-STATIONS.

R. M. FORDE, *Principal Medical Officer.*

I was in medical charge of Wulade during the year, paying regular monthly visits to Kanre-Lahun. At Wulade two European officials were on the sick list for ordinary fever and congestion of the liver, and five native officials for malarial fever. There is a hospital with four beds, and during the year a total of 231 patients were treated, the most prevalent diseases being rheumatism, gonorrhœa, diarrhœa, intestinal worms, malarial fever, bronchitis and dysentery.

The water supply is satisfactory, being obtained from springs close to the camp.

Vaccination was continued during the year with success.

There was one death in the Company from tuberculosis.

Kanre-Lahun.—I made regular monthly visits to this out-station during the year. The number of European officials was four, one of whom was on the sick list for fever. Their general health and that of the Frontiers was satisfactory.

There was no death. The chief diseases treated being: Rheumatism, gonorrhœa, orchitis, intermittent fever, diarrhœa, ulcers, minor injuries to feet, and bronchitis.

The water supply is good, and the general sanitary state of the camp is kept in a satisfactory condition.

DISPENSARY DISTRICTS IN THE PENINSULA.

The usual simple ailments were met with, serious cases being sent to the Colonial Hospital on the dispenser's advice. There were treated: New cases, 1,485; old, 2,047; total, 3,532.

Vaccination was performed during the year; 139 persons, chiefly children, were vaccinated. The sanitary condition of the villages was fairly satisfactory, and shows signs of improving. The water supply is good, and is obtained from mountain streams running near the village.

Goderich.—This branch dispensary was visited weekly by the dispenser at Regent. There were 2,742 cases treated. The sanitary condition of the village is fairly good.

Waterloo.—This has now become the centre of

the new headquarters district, and there is consequently an increase in the number of Government employees in the town. The health of all officials was fairly good during the year; of these 336 were treated, and there was no death. The total number of non-officials treated was 3,786. The sanitary condition of the station continued satisfactory. During the year the sergeant of police was appointed Sanitary Inspector for the district.

There was one suspected case of small-pox; strict measures were taken to isolate the case, and there was no further outbreak.

Vaccination was carried out during the year.

The water supply was considerably improved by an increase in public stand-pipes in the town, the source being a spring on an adjoining hill.

The Gaol.—The health of the prisoners was fairly good, there was no serious sickness among them; there was no outbreak of epidemic diseases to record during the year.

Vaccination was steadily performed, 171 persons having been vaccinated with a large number of successes.

The sanitary condition of the town was good.

Dublin (Bananas Islands).—There were 2,492 cases treated, the most prevailing diseases being: Fever, yaws, tertiary syphilis, rheumatism, and diseases of the digestive system.

Tertiary syphilis is present in various forms.

The public water supply is obtained from wells, and is not good. A masonry tank has been provided at the dispensary in which rain-water is collected. The sanitary condition of the towns has improved; they are not so overrun with pigs as formerly. There was no case of small-pox during the year.

MALARIAL INDEX OF COLONY.

SPLEENS EXAMINED IN ALL CASES (AND PARASITES FOUND IN ALL CASES TESTED FOR CONFIRMATION).

Town	Number of children examined	Enlarged spleens	Normal spleens	Percentage of infection	Remarks
Waterloo	100	69	31	69	The ages of children examined were from a few months to nine years.
Hastings	100	66	34	64	Many slides were taken in each place, and all such slides gave positive results.
Dublin) Bananas	50	25	25	50	The parasites of malignant tertian malaria were most in evidence.
Ricketts) Islands	34	14	20	41	Benign tertian was found in a few cases and mixed infections of both varieties in others. No crescents were found; no case of quartan fever either.
York	50	30	20	60	Many children were found with strong fever while at play and while in school.
Kent	31	25	6	80	Period of examination, April 8 to 20, 1909.
Tombo	25	19	6	76	
					Average for 7 towns, 62.8 per cent.

Colonial Hospital, Sierra Leone, *April* 25, 1909.

D. BURROWS, W.A.M.S.

the compound was kept in a proper sanitary condition.

Hastings.—This dispensary was visited bi-weekly. The total number of cases treated was 2,333. The general health was good. There was no outbreak of any infectious disease. Only ordinary simple diseases were met with. Two new stand-pipes were fixed in the town, thus increasing the supply of good water. The sanitary condition was fairly satisfactory. Vaccination was carried out steadily through the year. There was no case of small-pox.

York.—The water supply is from wells in the village, and is not wholesome.

The total number of vaccinations was 66. The lymph supplied was good. Only emergency visits were made to the neighbouring village of Sussex.

The number of cases treated was: New cases, 1,182; old, 421.

Rheumatism, yaws, dyspepsia, constipation and ulcers were met with in large numbers.

Mano Salija.—There were 1,612 cases treated during the year. The health of the district was fairly good.

Vaccination was carried on, forty-five children were vaccinated; the people do not seem very much in favour of vaccination.

Tombo.—The sanitary condition of the villages in the district is fair, the prevailing drawback to cleanliness in them being the presence of pigs, which are allowed to roam about.

The water supply is obtained from a stream that flows through the town.

The cases treated numbered 1,475.

Vaccination was carried on, there was no small-pox heard of in the district.

The following is a return showing the number of cases treated free and those cases entitled to medical attendance, with paying patients; the two latter are given in one figure:—

Officials and paying patients	11,654
Paupers or non-paying patients	60,906
Total treated	72,560

Actual amount expended on medicines, &c. ...	£1,378 11 7
Amount received from paying patients (natives)	71 7 0

Colonial Medical Reports.—No. 12.—Sierra Leone— *(continued).*

The rule is, that all patients who, in the opinion of the Medical Officer, can afford to pay for medicine must pay according to his or her means the sum of 3d., 6d., or 1s. for medicine prescribed.

The actual medical work done by the Department during the year shows an increase of 1,613 in the total number of cases treated. This increase occurred chiefly in the Colonial Hospital, where there was an increase of 5,875 cases in the out-patients, and 277 in the in-patients treated, over those of 1908.

Surgical operations at the same institution have also considerably increased in number—from 143 in the previous year to 222 in 1909.

Sleeping Sickness.—Though medical officers were on the look-out for this disease during the year, only one case was met with; this was Kaballa, in the Koinadugu district. Dr. Orpen reported on the case, the patient dying after prolonged treatment. Gland puncture and microscopical examination were not generally practised, so I am not in a position to state with any precision whether the disease is more prevalent in the Protectorate than the finding of only one undoubted case would lead me to expect, but the fact that the *Glossina palpalis* is found in pretty well all parts of the Protectorate leads to a strong suspicion of its greater prevalence.

There were 436 cases of syphilis treated; this is below the annual average, which for the previous five years has been 610.

From the reports of medical officers leprosy does not seem to be very prevalent, though occasional cases are met with throughout the country.

Only two cases of small-pox were reported during the year. The regular vaccination practised in the Colony and Protectorate, and the continued efficiency of the lymph obtained from the Liverpool Institute of Preventive Medicine, largely account for the almost entire absence of this malady.

Four cases of malignant new growths were treated and specimens of them sent to the Cancer Research Committee. Yaws (Frambœsia) does not seem anything like so prevalent in this Colony as in other parts of West Africa; during the year 151 cases were met with.

W. A. OJUMIRE-TAYLOR.

Colonial Medical Reports.—No. 13.—British Guiana.

MEDICAL REPORT FOR THE YEAR 1909-1910.

By J. E. GODFREY.

Surgeon-General.

PUBLIC MEDICAL INSTITUTIONS.

Public Hospital, Georgetown.

THIS Institution has accommodation for 291 males and 245 females.

11,263 patients were admitted during the year, and with the 400 patients remaining in hospital on April 1, 1909, make a total of 11,663 patients treated.

The number of out-patients treated was 43,556.

There were 1,237 deaths. This gives a death-rate of 10.6 per cent. of the total number treated.

Of the total deaths, 283, or 22.8 per cent., died within twenty-four hours, and no less than 40 per cent. died within seventy-two hours after admission.

The Resident Surgeon states that these cases were all dying on admission and past all human aid.

There were 475 births in the maternity ward.

Nursing Staff.—I again desire to draw attention to the excellent work done by the Nurse Superintendent and her assistants in maintaining the high standard of training and teaching the nurses. She has, I venture to say, brought the nursing in this hospital to a very high state of efficiency, and it compares favourably with the nursing in the hospitals of Great Britain. That this has been appreciated by the patients and the community generally, we have ample testimony. In losing her the hospital has lost a very valuable officer and one whose place it will be hard to fill.

I regret to have to report that the Junior Divisional Nurse was compelled to resign her appointment through ill-health; during the time she was attached to the hospital she performed her duties faithfully and efficiently.

During the year 122 lectures and practical demonstrations in the wards were given by the medical officers, the Superintendent of Nurses, and divisional nurses.

The following examinations for nurses were held: *Probationers.*—In September, 1909, twenty-four entered and thirteen passed; in February, 1910, seventeen entered and twelve passed. *Nurses (Final).*—In March, 1910, when ten passed out of sixteen. *Midwifery.*—In October, 1909, when seven passed out of twelve; in April, 1910, when five passed out of twelve.

The following return shows the number of operations performed and the revenue derived therefrom.

Number of operations (major)	...	705
Revenue from paying patients	...	$7,744.18
Revenue from operations ...	...	300.00
Miscellaneous receipts ...	...	390.53

Public Hospital, New Amsterdam.

This Institution has accommodation for 96 males and 54 females.

There were 3,349 patients admitted, and with 134 remaining on April 1, 1909, make a total of 3,483 patients treated.

The number of out-patients treated was 21,863.

There were 399 deaths, which gives a death-rate of 11.4 per cent. of the cases treated.

Of the total deaths 90, or about 23 per cent., died within twenty-four hours of admission.

There were 81 births in the maternity ward.

The training of nurses at this Institution has, I regret to say, been suspended, as owing to ill-health the Superintendent of Nurses had to relinquish her post; her place has not yet been filled.

Public Hospital, Suddie.

This Institution has accommodation for 54 males and 26 females.

There were 1,430 patients admitted, and with the 70 remaining on April 1, 1909, make a total of 1,500 patients treated.

The number of out-patients treated was 5,889.

There were 198 deaths, which gives a death-rate of 13.2 per cent. of the cases treated.

Of the total deaths no less than 133 died within seventy-two hours of admission.

There were 13 births, of which 5 were stillborn.

Public Hospital, Bartica.

This Institution has accommodation for 24 males and 11 females.

There were 277 patients admitted, and with the 6 remaining on April 1, 1909, make a total of 283 treated.

The number of out-patients treated during the year was 1,012.

There were 25 deaths, which gives a death-rate of 8.8 per cent. of the cases treated.

Of the total deaths 14 died within seventy-two hours of admission.

There were one birth and three still-births during the year.

Public Hospital, Morawhanna and Arakaka Ward.

(1) There is accommodation for 14 males and 11 females.

There were 422 patients treated and 25 deaths, which gives a death-rate of 5.9 per cent.

Of the total deaths 7 died within seventy-two hours of admission.

There were 1,570 out-patients treated.

(2) *Arakaka Ward.*—There is accommodation for 12 males.

There were 173 patients treated and 6 deaths, giving a death-rate of 3.5 per cent.

Of the deaths two died within seventy-two hours of admission.

There were 756 out-patients treated.

Lunatic Asylum.

There were 462 males and 274 females in the Asylum on April 1, 1909. During the year 76 males and 65 females were admitted, 36 males and 31 females were discharged, and 42 males and 33 females died. The percentage of mortality on the total number treated was 8.6.

Leper Asylum.

On April 1, 1909, there were 306 males and 125 females in the Asylum. During the year 73 males and 29 females were admitted, and on March 31, 1910, there were 287 males and 126 females in the Asylum. There were 98 deaths, 73 males and 25 females, giving a death-rate of 18.3 per cent.

The conduct of the inmates was satisfactory. Absconding still occurs, but not to such an extent as in previous years.

The farm produced 43,404 lb. of provisions, consisting of: Plantains, 22,706 lb.; cassava, 19,104 lb.; greens, 1,177 lb.; sweet potatoes, 417 lb. The value was $481 15.

The majority of the inmates keep their cottages and grounds neat and tidy. They are given small plots of ground in which during their spare time they are allowed to grow vegetables and these are either used by themselves or sold to the store for consumption within the Asylum.

The produce from these plots was: Plantains, 25,548 lb.; cassava, 7,191 lb.; greens, 1,228 lb.; eddoes, 444 lb.; sweet potatoes, 534 lb.; valued at $398 31.

PUBLIC DISPENSARIES.

Georgetown.

There are three dispensaries in the city:—

No. 1 Dispensary at the Police Station, Broad Street.

No. 2 Dispensary at the Almshouse.

No. 3 Dispensary at the Public Hospital.

Country.

There are seven country dispensaries, situated as follows:—

(*a*) *Demerara River.*—At Akyma.

(*b*) *Berbice River.*—At Ida Sabina.

(*c*) *Upper Pomeroon.*—District extends from the Tapacooma Lake to and inclusive of Urua.

(*d*) *Lower Pomeroon.*—The district extends from but exclusive of Urua, to the mouth of the Pomeroon River, and includes the Wakapoa Creek and its tributaries.

(*e*) *Moruca River.*—The district extends from the mouth of the Moruca River up to Kamwatta, including all the tributaries and settlements.

The dispensers in charge are provided with corials for the purpose of paying periodical visits to the different grants, homesteads, and missions.

(*f*) *Potaro.*—About eleven miles from the Potaro Landing, and provided with six beds for the reception of urgent cases.

(*g*) *Albouystown.*—On account of the very large number of cases seen at No. 1 Dispensary, which originally included Albouystown, it was decided to open a separate one there, and thus relieve the pressure on No. 1.

Return of Diseases and Deaths in 1910 at the following Public Hospitals:—

Georgetown, Berbice, Suddie, Bartica, and North-Western District, British Guiana.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	14	—	14
Anæmia	131	18	131
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	2	1	2
Chicken-pox	2	—	2
Cholera	—	—	—
Choleraic Diarrhœa	523	124	523
Congenital Malformation	—	—	—
Debility	174	46	174
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	8	—	8
Diabetes Insipidus	—	—	—
Diphtheria	18	3	18
Dysentery	—	—	—
Enteric Fever	36	14	36
Erysipelas	15	2	15
Febricula	7	—	7
Filariasis	—	—	—
Gonorrhœa	199	1	199
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	194	2	194
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	8	—	8
(*b*) Anæsthetic	22	2	22
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	2,369	37	2,369
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	12	2	12
(*c*) Pernicious	89	40	89
(*d*) Malarial Cachexia	25	1	25
Malta Fever	—	—	—
Measles	9	—	9
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	78	4	78
Malignant	75	16	75
Old Age	10	3	10
Other Diseases	4	1	4
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	9	7	9
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	305	—	305
Rheumatoid Arthritis	—	—	—
Scarlet Fever	1	—	1
Scurvy	—	—	—
Septicæmia	56	47	56
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	1	—	1
Syphilis	—	—	—
(*a*) Primary	15	1	15
(*b*) Secondary	99	3	99
(*c*) Tertiary	114	7	114
(*d*) Congenital	28	10	28
Tetanus	23	11	23
Trypanosoma Fever	—	—	—
Tubercle—	66	24	66
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	6	—	6
Yaws	34	1	34
Yellow Fever	1	1	1

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	695	22	695
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	98	17	98
(*b*) Other Diseases	167	59	167
Digestive System—	—	—	—
(*a*) Diarrhœa	506	60	506
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	13	1	13
Congestion of Liver	5	—	5
(*d*) Abscess of Liver	14	3	14
(*e*) Tropical Liver	3	1	3
(*f*) Jaundice, Catarrhal	34	6	34
(*g*) Cirrhosis of Liver	90	33	90
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	881	82	881
Ear	50	—	50
Eye	291	—	291
Generative System—	—	—	—
Male Organs	495	2	495
Female Organs	1,312	64	1,312
Lymphatic System	190	2	190
Mental Diseases	128	1	128
Nervous System	324	57	324
Nose	22	—	22
Organs of Locomotion	351	7	351
Respiratory System	1,897	544	1,897
Skin—	—	—	—
(*a*) Scabies	62	—	62
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	29	—	29
(*f*) Other Diseases	964	4	964
Urinary System	979	296	979
Injuries, General, Local—	703	121	703
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	217	13	217
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	337	50	337
Filaria medinensis (Guinea worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	6	1	6
Corrosive Acids	1	—	1
Metallic Poisons	2	—	2
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	12	1	12
Surgical Operations—	5,223	48	5,223
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	48	—	48
(*c*) Other Eye Operations	—	—	—

The following table shows the number of persons treated:—

Dispensary	Paying Patients	Police Patients	Paupers	Total
No. 1	305	—	11,622	11,927
Albouystown	205	—	25,077	25,282
No. 2	325	—	6,964	7,289
No. 3	102	—	10,670	10,772
Potaro	1,709	116	112	1,937
Demerara River	228	24	524	776
Berbice River	443	—	416	859
Upper Pomeroon ...	155	18	779	952
Lower Pomeroon ...	367	46	638	1,051
Moruca	22	1	847	870
Total	3,861	205	57,649	61,715

Prison Hospitals.

The following table shows the number of prisoners admitted and the number of deaths in these hospitals during the year:—

Institution	Admitted to Hospital			Died in Hospital		
	M.	F.	T.	M.	F.	T.
H. M. P. Settlement ...	164	—	164	4	—	4
Georgetown	116	20	136	1	—	1
New Amsterdam ...	34	11	45	1	—	1
Suddie	33	2	35	—	—	—
Total	347	33	380	6	—	6

Onderneeming Industrial School for Boys.

The general condition of the Hospital and its surroundings have been satisfactory. There were 411 in-patients with no deaths.

Orphan Asylum.—The Medical Officer to the Almshouse has the medical charge of the inmates. The sanitary arrangements are satisfactory, and the children continue to enjoy good health.

Almshouse.—The infirmary wards attached to this Institution are under the medical charge of a private medical practitioner, who is also in charge of No. 2 Dispensary, Georgetown. A large number of cases of chronic disease, unable to maintain themselves and not likely to benefit by hospital treatment, are sent from the hospitals to this Institution.

Sugar Estates.—The estates' hospitals at Plantations Ma Retraite and Cornelia Ida were closed. A new female ward was added to the hospital at Plantation Albion, and the accommodation of the hospital at Plantation Mara increased from 48 to 72 beds.

At the close of the year there were 39 estates' hospitals with a total of 2,490 beds.

58,349 patients were admitted to the estates' hospitals, and there were 1,386 deaths, which gives a percentage of 2.3 deaths to admissions.

It is interesting to report that there was an appreciable decrease in the number of cases of infantile convulsions, and the Medical Inspector, in commenting on this, mentions that Dr. Ferguson found that there had been a marked decrease in the Peter's Hall district since he began the regular and systematic distribution of quinine.

There were 1,563 fewer cases of malarial fever treated than in the previous year, which, I think, shows that the general improvements in sanitation and the adoption of antimalarial methods on the estates are bearing fruit. The Medical Inspector adds that "rice cultivation has accounted for a very considerable increase in this disease, nullifying to a great extent the benefits we otherwise would have gained from improvements in general sanitation." He also points out that there were serious outbreaks on a number of estates at the time of rice-reaping, and adds: "My belief is that these outbreaks would have been more severe and more general had it not been for the prophylactic measures undertaken early in the year"; the measures he refers to being the regular daily administration of quinine to all employees.

Dr. Kennard, the Medical Officer of the Port Mourant district, addresses the following interesting and instructive minute to me on the increase of malarial fever on the estates in his district:—

"I consider the increase of malarial fever on these estates, which is especially marked at Albion, to be due to the following causes, all aiding each other: (1) The settlement of the people in or adjoining the rice fields; (2) in consequence of not having the usual showers, the rice required more irrigation and much of it was cut when the fields were still partly swamped; (3) the abnormal condition of the weather, no rain, excessive heat, little breeze."

Regarding (1), we notice yearly at Port Mourant the amount of fever cases that come from the settlements of Miss Phoebe and Ankerville, which are situated at the rice fields. At Albion the increase of malarial fever was first noticed in August, the cases coming mostly from a new settlement in a place among the rice fields aback, called the "Long John"; it was so severe, and I understand practically everybody there got it, that most of the people left this place; following shortly on these cases came in many people from the "Guava Bush," also a practically new settlement in the rice fields; then more cases from the "Sand Reef," which is an old settlement in the rice fields on one side of the "Guava Bush" and nearer the estate proper; then we got more cases from the estate proper yard.

Regarding (2), usually light showers fall for the ripening rice so that the fields are not kept swamped, the ground is dry and the facilities for mosquito-breeding is not so marked as this year.

Regarding (3), the weather has kept abnormal, hot, dry and close, and the ordinary breeze has been mostly absent; the people work night and day when reaping their rice, sleeping frequently in the fields at night, and working in the swampy fields under these conditions has diminished their natural resistance more so than usual.

Colonial Medical Reports.—No. 13.—British Guiana— *(continued).*

In spite of quinine having been given out freely to the people, especially at Albion, where the dispenser put on to give it out visits also the "Sand Reef," "Guava Bush" and school daily with quinine, conditions (1) and (3) remaining the same with the increased amount of people becoming infected has kept up the number both for October and this month as well.

I think the unusually large proportion of free people admitted to hospital supports my opinion, as they mostly live outside the yard proper.

Vaccination.

Glycerinated lymph is imported for the use of public vaccinators, to whom it is supplied free of charge. There were 2,082 successful vaccinations during the year.

Health of the Colony.

Death and Birth Rates.

It is satisfactory to report that the colony has been free of any dangerous, infectious, or contagious diseases.

During the year 9,367 deaths occurred, or 14 less than last year. This represents a death-rate of 30.0 per 1,000, compared with 30.8 per 1,000 for the year previous.

There were 8,947 births, or 648 more than in the past year, representing a birth-rate of 29.3 as against 27.3 for 1908-9.

The deaths exceeded the births by 420 this year; last year there was an excess of deaths of 1,082.

It is of interest to note that during the year under review, there has been an appreciable increase in the birth-rate, while, on the other hand, the death-rate shows a very slight decrease.

Infantile Mortality.

The mortality amongst children under 1 year, it is to be regretted, continues to be high; in 1909 there was 1,872 deaths, or 209 per 1,000, which is an increase on the previous year's figures, 1,644 deaths, or 198 per 1,000; but still less than in 1907, when the figures were 2,202, or 256 per 1,000. The mean rate for the past five years is 210 per 1,000.

Tuberculosis.

During the year, tuberculosis was the cause of 5.9 per cent. of the total mortality of the colony, and in Georgetown 8.8 per cent.

The Society for the Prevention and Treatment of Tuberculosis has continued its good work during the year. I know, from being in close touch with the working of this Society, that the scope of its work is being gradually extended, but the want of funds stands in the way.

Malarial Fever and Anti-Malarial Measures.

There has been considerable activity and a pronounced interest is taken by the public generally in the question of the prevention of malarial fevers.

On the sugar estates, the screening of water receptacles, the abolition of other breeding grounds of mosquitoes, the cutting down of useless bush and trees, and the free distribution of quinine to their labourers, have continued throughout the year.

In the city of Georgetown an attempt has been made to enforce the regulations with regard to vat-screening.

In the town of New Amsterdam, I regret to say that nothing has been done.

In the country districts generally, no active steps have been taken. I am afraid that no real solid work will be done with regard to the abolition of the breeding grounds of mosquitoes until a law, which I have advocated, is passed and put in force. To the different local authorities in the villages and country districts we must look for help in pushing on and educating the people to take a greater interest in diminishing preventible diseases. During the year, as Chairman of the Local Government Board, I addressed a circular to the different local authorities calling attention to the matter.

It is gratifying to report that the sale of quinine at cost price at the different Post Offices, which was introduced in December, 1906, is steadily increasing, and is being appreciated and taken advantage of by the people.

Leprosy.

Professor Deycke's Nastin treatment was continued at the Leper Asylum during the year under the supervision of the Bacteriologist. I stated in my last report that no definite pronouncement could yet be made as to whether Nastin is a cure for leprosy. In some of the cases there has been undoubtedly considerable improvement which it is hoped will ultimately be permanent.

Anchylostomiasis.

On the sugar estates steady progress was made in the measures which have now for some time been advocated by this department, *viz.*:—

(1) The erection of latrines.

(2) The systematic examination of all newly-arrived immigrants and of all persons suffering from anæmia or showing the least sign of being infected with the anchylostome parasite.

(3) The treatment and constant observation of all known infected cases.

In this connection it is gratifying to report that every estate is now supplied with latrines. There has been a very marked diminution of the number of cases, particularly of those severe cases which were so common a few years ago, and it has been found practical and advisable to treat the milder infected cases as out-patients.

The introduction every year of a large number of anchylostome-infected East Indian immigrants is a very serious factor in preventing not only much better results, but also the eradication of the

disease. Last season no less than 74.4 per cent. of the new immigrants were found to be infected.

Drinking-water.

The matter remains in very much the same position as it was when I wrote my last report. As I have said before, the storing of drinking-water in open trenches and ponds is indefensible. I have advocated, and I still advocate, the adoption of the system in use at Plantation Blairmont, that is, the erection of tanks for storing the water.

Quarantine.

During the year there was:—

(*a*) Yellow fever in Barbados, Martinique, and Venezuela.

(*b*) Plague in Trinidad and Venezuela.

(*c*) Small-pox in Grenada.

The precautions against infection permitted by the Quarantine Regulations were enforced in each case, and happily the colony escaped infection.

The disinfecting machines were tested at regular intervals and found to be in good working order.

Subsidized Nurse-Midwives in Districts.

During the year twelve women were qualified as nurse-midwives. Of this number eleven were trained at the Public Hospital, Georgetown, and one at the Public Hospital, Berbice. Four students received subsidies amounting to $112.02 to assist in maintaining themselves whilst undergoing training at the Public Hospital, Georgetown. The examination for these certificates is very much more difficult than formerly. In addition to certificates, sign plates are now given to those women who are certified by Government examination. Midwives' outfits are obtained from the Medical Supply Association, and supplied, without charge, to certain nurse-midwives to enable them to be in a position to properly perform their duties. I look forward to the day when every village will have a qualified nurse-midwife.

In July, 1908, a scheme was started for the purpose of providing the poor women in the city of Georgetown who, for one reason or another, do not care to go to the maternity ward of the Public Hospital, with the assistance of trained and certified nurse-midwives. Two midwives were specially attached to the maternity ward for this purpose, their duty being not only to attend to the mothers at their homes, but to give advice as to the feeding, &c., of the infants. The Nurse-Superintendent, in her annual report, writes that this scheme has prospered beyond our hopes. There is no doubt that it has proved a great boon to the poorer classes, and should in time prove a very important factor in reducing our high infantile mortality. Seventy cases have been delivered during the year, and 1,172 visits paid. Cases are always on the books and visits have to be paid to these, in addition to the daily routine visits.

I am glad to say that the Combined Court has made provision for the appointment of two more midwives during the present financial year.

There are four subsidized nurse-midwives in the following outlying districts: Mahaicony, Pomeroon, Moruca, and North-Western.

Bacteriological Department.

In consequence of the increase of work the Combined Court sanctioned the appointment of an Assistant Bacteriologist, and shortly before the close of the year information was received that Dr. E. P. Minett had been selected to fill the post.

There is no doubt now that the necessity for this department has been borne out by results. The assistance rendered by the Bacteriologist not only to the staff of the public hospitals, but to private medical practitioners, in assisting in the diagnosis of difficult and doubtful cases is well known, and, I am sure, fully appreciated. It is interesting to note that out of a total of 2,553 specimens examined during the year, no less than 1,290 were sent by private medical practitioners.

The City of Georgetown.—In consequence of statements made that there was an outbreak of virulent fever in the city, and also that it was due to the screening of vats against mosquitoes, the acting Health Officer, the Government Bacteriologist, and myself, were asked by the Government and Town Council to investigate and report.

It was conclusively shown that while there had been a certain number of cases of diphtheria and enteric fever, in neither case were they sufficient to say that the disease was either of an epidemic or virulent character. In my opinion, the opposition to the enforcing of the vat-screening regulations was chiefly the cause of the rumour, and, as it had been said that the screening rendered the water unfit for drinking purposes, in our report we took the opportunity of making a definite statement that no deleterious effects nor disease properties of any kind are produced or increased in water by screening water-containing receptacles against mosquitoes.

In this connection I would particularly draw attention to the Government Bacteriologist's remark: "The water in unscreened vats contains on an average 1,031 micro-organisms per cubic centimetre, and that in vats which have been screened for a year or longer the average is only 534.8 per cubic centimetre."

Colonial Medical Reports.—No. 14.—Annual Returns of the Lunatic Asylums in Bengal.

MEDICAL REPORT FOR THE YEAR 1909.

By COLONEL R. MACRAE, M.B., V.H.S., I.M.S.

Inspector-General of Civil Hospitals, Bengal.

THE number of lunatics on January 1, 1909, was 865; 196 were admitted during the year (including 19 re-admissions), 106 were discharged, 47 died, and 908 remained under treatment at the end of the year against 865 in 1908. The proportions per cent. of criminal lunatics to the total population on December 31 of each year were 39.87 and 41.15, respectively.

The daily average number resident was 717.72 males and 168.82 females, the maximum number confined in any one night was 742 males and 177 females, while the accommodation available was for 761 males and 202 females, so that the asylums were not overcrowded during 1909. There was, however, some stress of accommodation at certain times of the year either in the criminal division, pauper wards, or on the male side of the asylums, which was met by readjustment of class accommodation. Judging from the total daily average number of patients, *viz.*, 827.08 in 1906, 849.29 in 1907, 851.33 in 1908, and 886.54 in 1909, and also the total population on December 31, which was 836, 852, 865 and 908 in those years, respectively, there is a marked tendency towards increase in the number under confinement, and within another year or two at the present rate of increase the question of increased accommodation will be pressing. This is being dealt with separately.

Admissions were greater by 9, being 177 against 168 in the previous year. Patna had 12 more, and the number sent to Berhampore from Calcutta and the 24 Parganas increased by 5, the figures being 61 against 56 in 1908.

Re-admissions numbered 19 against 17 in the previous year. Most of them were, as usual, criminal lunatics returned to the asylums after trial. Two had relapses in jails—one was a recovered lunatic who was sent back to the asylum after fourteen days only, and the other, who had been undergoing sentence, was returned to the asylum after six months and four days. Of the six non-criminals, in one instance the lunatic, who had been sent for trial, was discharged and made over to the care of his friends by the trying magistrate. He was, however, received back after ten months. Another, a criminal lunatic, who had been made over to his friends under the orders of Government, was returned to the asylum after about eight months.

The number discharged from the asylums was 106 against 107 in 1908. Of these, recoveries are represented by 69 and 65 cases, respectively; the percentages calculated on the daily average number in residence being 7.78 against 7.64 in the previous year. At Berhampore a large number of favourable male cases were admitted during the year 1909, which mainly increased the number of recoveries from 26 in 1908 to 40 in 1909, and the percentage on the daily average number resident from 4.28 to 6.43. It is remarkable that at Patna the recovery rate amongst the females was as high as 20.91 per cent. against 8.92 in 1908, although their cases are, as a rule, the most intractable.

Sickness and Mortality.—Taken collectively the health statistics of the asylums show a marked decrease in sickness, the total admissions to hospitals being 655 against 746 in 1908. The slight increase in daily average sick, 115.72 against 101.31 in the previous year, was mainly due to the treatment of some chronic cases and to the placing on the sick list of lunatics with slight temperature to prevent further development during the severe monsoon. The latter circumstance chiefly accounts for the increase in fever cases, which numbered 248 against 149 in 1908. There were two cases of kala-azar, one ending fatally. Bowel complaints (dysentery and diarrhœa) were fewer, *viz.*, 43 against 48 in the previous year. Thirty patients were admitted for tubercular phthisis against 33 in 1908. The number of deaths from this cause was also fewer, 13 against 17 in 1908. The total mortality was 47 against 65 in 1908, and the death-rate was strikingly low, it having been 5.30 per cent. against 7.63 in 1908. This is, indeed, very satisfactory.

The rate of mortality in Bengal for 1909 was much less that what obtained in that year in the United Provinces (9.41), Madras (7.09), Punjab (13.43) and Bombay (13.1), and Eastern Bengal and Assam (13.51).

Criminal Lunatics.—The number on the books on January 1, 1909, was 356; 75 were admitted against 81 in 1908, and 13 were readmitted, the same number as in the previous year. The number discharged fell from 121 in 1908 to 64 in 1909, the decrease being chiefly due to the fact that whereas in 1908, 63 old chronic patients charged with trivial offences were transferred to the non-criminal list under the special sanction of Government, the number so transferred in 1909 was 8 only. Efforts were continued during the year under review to find out the relatives of harmless insanes whose

crimes were not serious in order that they might be induced to take charge of them, and the results were successful in some cases. There were 18 deaths against 20 in 1908.

Most of the admissions, *viz.*, 118, or 60.20 per cent., were cases of mania. As such cases are more amenable to treatment, recoveries amongst them are generally largest, as was the case in the year under review, *viz.*, 45. Melancholia furnished 46 cases, or 23.47 per cent., with 19 recoveries. There were 8 admissions in 1909 from delusional insanity, four Europeans and four Indians. There was one case of general paralysis of the insane, a rare type in this country. The patient, a native of Sambalpur, was a criminal lunatic, a Hindu (Sahara), who was received into the Berhampore Asylum. The Superintendent reports that the case was of the convulsive type of general paralysis. The lunatic died. Dementia accounted for 7 admissions in 1909. It is remarkable that under its epileptic form there was one recovery. The patient was under treatment at Bhawanipur.

Ninety-nine, or 50.51 per cent., of the number admitted owe their mental breakdown to physical, and 13, or 6.63 per cent., to moral causes, while in 42.86 per cent. of the cases the cause of insanity was unknown. In 8 cases the mental aberration was attributed to hereditary influences, in 42 to abuse of *ganja*, in 11 to intemperance in drink, and 3 to other intoxicants, *viz.*, toddy. There was a distinct increase, *viz.*, 11, in the number of *ganja* cases at Berhampore during the year under review. The Superintendent states that the antecedents of these cases, where the medical history sheets were defective, were verified by communications with the relatives of the patients and the police. It is reported that the medical history sheets of the lunatics who were sent to asylums were prepared with greater care during the year under review, but that there is yet much room for improvement in this respect. In the revised rules for the management of lunatic asylums, which are about to be adopted, this form and its heading have been altered, so that there may be no misapprehension or mistake on the part of those concerned as to who are responsible for filling it in and for their correctness and completeness, which are matters of much importance.

Injuries and Accidents.—The catalogue of these was large at Berhampore, but almost all were of a trivial nature and need not, therefore, be detailed. There were two cases of snake-bites, which were treated with antivenine. The patients recovered. There was, however, no record of the kind of snake inflicting the wounds. Every effort was made to rid the asylum of these reptiles. At Patna a criminal lunatic who had been under treatment in the hospital for dysentery was found by the overseer to be bleeding and evidently seriously injured, the base of his skull having been found fractured. He died shortly afterwards. The Magistrate who inquired into the case was unable to say whether the injuries were self-inflicted or otherwise. The warder on duty disclaimed any knowledge of the circumstances under which the injuries were received, but the Superintendent punished him by dismissal for suspected remissions. Another warder of this asylum was also dismissed for assaulting a lunatic.

Escapes.—Two lunatics escaped from the Berhampore Asylum; one was recaptured and brought back to the asylum. The other, a criminal lunatic, was at large up to the end of the year. The warders through whose negligence these men escaped were duly punished.

There was no important change in the establishment attached to the asylums.

The manufacturing department yielded a net profit of Rs. 7,213-7-7. At Patna the profits were greater when compared with the previous year, owing chiefly to the garden having been more productive and to a lower price having been paid for raw materials. The net earnings from manufactures at Berhampore fell off in the year under review, chiefly because the sale of garden vegetables to the outside public was restricted to meet the requirements of a larger population in the asylum. The garden itself did not fare well during the cyclonic disturbances. Altogether 56.72 per cent. of the lunatics were employed on various industries in 1909 which were judiciously selected, the principal object being to keep them employed on some sort of congenial work, which is essential in the treatment of the insane. A bakery was started at Berhampore through the exertions of the Deputy Superintendent. It was most useful to the asylum and to the public. The system of rewarding hard-working and well-behaved lunatics was continued during the year under review. The dairy at Berhampore, which is a valuable part of the asylum, also showed a profit.

General Remarks.—Despite the unsuitability of some of the buildings in which the asylums are located and their unhealthy surroundings, the death-rate among the lunatics showed a further reduction in the year under review. This admits of one conclusion, *viz.*, that the sanitary conditions in the asylums have been much improved and that much personal attention on the part of the superior staff was bestowed on the details of asylum management. The infirm gang system was maintained with advantage to the weakly and debilitated patients. Prophylactics were issued to the lunatics in all the asylums during the unhealthy seasons of the year. The Superintendent at Berhampore states that but for this cases of malarial fevers would have been more numerous. The lunatics were treated to various kinds of amusements, and were provided with pet animals, and musical instruments to keep them lively and cheerful. The total amount spent on amusements was Rs. 452-4-6. Thus the physical and mental welfare of the patients received due attention.

I have pleasure in stating that the management of the asylums during the year has been entirely satisfactory, and that much credit is due to the superior staff.

Colonial Medical Reports.—No. 15.—The Medical and Health Departments of Western Australia.

MEDICAL REPORT FOR THE YEAR 1909.

By JAMES W. HOPE, F.R.C.P.Ed., L.S.A., D.P.H., R.C.P. & S.I.,

Principal Medical Officer.

Vital Statistics.

Population.

Mean population of the State, 1909 ...	274,755
Mean population of the State, 1908 ...	268,347
Increase	6,408

Births.

Numbered	7,601
Being at the rate per 1,000 population	27.66
Illegitimate, per cent. total births ...	4.55

Deaths.

Numbered	2,706
Being at the rate per 1,000 population	9.84
Natural increase per 1,000 of population	17.8

Infantile Mortality.

Per 1,000 births	78

Deaths from typhoid, 83; percentage total deaths, 3.07; per 1,000 population, .30.

Deaths from diphtheria, 81; percentage total deaths, 3.04; per 1,000 population, .29.

Deaths from phthisis, 188; percentage total deaths, 6.95; per 1,000 population, .68.

Deaths from tubercular diseases, all other, 43; percentage total deaths, 1.48; per 1,000 population, .15.

Deaths from maternity, 46; percentage total deaths, 1.74; deaths of mothers to births, .61.

Marriages.

Total 1909: Per 1,000 of population ... 7.27

With one exception during the past ten years the marriage rate has steadily declined, as the following figures show:—

1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
9.92	10.06	9.66	9.83	9.32	8.83	8.48	8.70	8.06	7.50	7.27

Life in this State gives no excuse for this, inasmuch as there is no poverty, but there may be some paucity of the females in comparison to males. It, however, follows the conditions which are observed in some parts of the Empire, where marriages are not so frequent proportionally as in the past. The tendency seems to be to delay marriage until later in life than heretofore. Women are more employed in many walks of life, which give them an independent existence.

Births.

The following table shows a decline in the birth-rate of 3.04 per 1,000 of the population during ten years:—

1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
30.70	38.3	30.36	30.29	30.27	30.34	30.30	30.02	29.24	28.63	27.66

Illegitimates.

1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
4.29	4.82	3.88	3.96	4.70	4.36	4.19	4.78	3.89	4.35	4.55

In consequence of the continued low birth-rate, the corresponding low death-rate permits of a satisfactory natural increase being recorded, for 17.8 in this State bears favourable comparison with the other States, and is better than in England and Wales, and most European towns, at least for the five years 1901-5.

	Net annual increase per 1,000 population
Germany	14.3
Denmark	14.1
Sweden	10.6
Switzerland	10.4
France	1.6
Italy	10.7
Belgium	10.7
Norway	10.7
Spain	9.2

States Table.

State	Year	Net annual increase per 1,000 population
New South Wales	1909	... 15.19
Victoria	1908	... 12.12
South Australia	1908	... 15.01
Queensland	1908	... 16.48
Tasmania	1908	... 19.18
New Zealand	1909	... 17.88
Western Australia	1909	... 17.81
England and Wales,	1901-5	... 12.1
England and Wales,	1908	... 11.8

To every square mile of country in 1907 there lived in Victoria, 14.20 persons; Tasmania, 7.02 persons; New South Wales, 5.06 persons; Queensland, .81 person; South Australia, .43 person; Western Australia, .27 person, which shows that plenty of elbow room will exist for awhile.

Deaths equalled per 1,000 of the population, 9.85. This is an improvement upon past years.

In 1899, with a population of 170,651, there died 2,324, equal 13.79 per 1,000 population.

In 1909, with a population of 274,755, there died 2,882, equal 9.85 per 1,000 population.

During the past ten years the rate of mortality was:—

1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
13.79	12.65	13.37	13.71	12.60	11.91	10.82	11.87	11.17	10.74	9.85

Infant Mortality.

Almost as many children die during the first year of life as die during the next thirty years.

Thus in the first year of life there died 593, while from one year to thirty years there died 612.

The deaths under one year numbered 593, equal to 78 per thousand births. Of this number no fewer than 160 died under one week, mainly from congenital malformations and debility (which causes were responsible for 138 deaths). In these 160 cases the infants really had no chance of life, and if they be excluded from the calculations the mortality rates are reduced to 57 deaths per thousand births, or 7.24 per thousand of population.

Percentage of deaths under one year to births during period:—

1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909
13.99	12.61	12.89	14.20	14.12	11.30	10.42	11.0	9.77	8.17	7.80

Further improvements may be made and considerable saving of life effected.

From 1899, when the rate per cent. was 13.99, to 1909, when the rate was 7.80, is very encouraging, and shows that the care of infants is better understood, and their environment improved. Disturbances of the alimentary tract, as usual, cause the chief loss.

Enteritis is recorded as causing deaths in 140 cases out of a total under one year of 593 deaths.

That there may be less loss of life from ignorance of young mothers how to nurse their offspring is probable.

It has been the custom for some years to present to everyone registering a birth a few printed instructions and advice, the salient point being that breast feeding is the essential element of success, adding to the child's chance of living, of growing up strong, healthy, happy, and thus repaying the mother by some freedom from anxiety, expense for treatment, disturbance of domestic happiness, and broken rest.

Where artificial feeding is necessary, so much additional care must be exercised in protecting the food from contamination by dirty utensils, dust and insects, and keeping milk cool. In many cottages the latter can be effected by using a canvas cooler kept damp. Freedom from contamination can always be got with care. Fifteen babies artificially fed die to one that is breast fed. The fate of a nation rests in the lap of the mother.

Typhoid.

Number of cases notified	641
The death percentage of total deaths in 1908 =	2.65
1909.—Deaths 83 = per 1,000 population ...	.30
Percentage of total deaths =	3.07

The chief places contributing to the outbreaks were:—

Metropolitan Area.

Perth and Suburbs	208	
Leederville	33	
Subiaco	23	
		264
Fremantle		70
Midland Junction	19	
Guildford	7	
West Guildford	5	
		31
Claremont		15
Victoria Park		12
		392

Goldfields and Country.

Kalgoorlie	34	
Kalgoorlie Road District ...	26	
Boulder	23	
		83
Meekatharra (Murchison)		15
Southern Cross		7
Menzies		12
Ravensthorpe		11
		128

The balance were scattered over the different parts of the State.

The environments of cases indicate that carelessness existed in carrying out reasonable precautions, notwithstanding that printed leaflets giving advice have been circulated by the Central Board of Health to all Local Boards.

In some cases the origin is difficult to locate, and whether due to carriers or not is uncertain.

That "carriers" are the cause in many outbreaks is a well-established fact, and beyond the care exercised at the time of sickness it is important that all who have been attacked should have impressed upon them the danger they may be to others for a considerable time, and periodical examinations of the urine and excreta for some months should be the rule.

No person should ever be employed in a dairy or handling foodstuffs who has had typhoid, until such proof is forthcoming after bacteriological examination that no harbouring of the bacilli continues. As long as the germs are in the system such persons are likely to pass them from time to time, and thereby be a fresh focus for infection.

So far no royal road has been discovered for certain to eliminate the whole of these bacteria from the system, therefore one has to provisionally consider that "once a carrier always a carrier."

Every private place and all public places should have water and a towel in them. A little disinfectant in the water will add to its usefulness.

The whole of the State at present, it may be said, is subject to the "pan" system in closets, and as regards the danger from flies, which are important factors in carrying diseases, the "pan" is more dangerous than the old dark and deep cesspits. The pans are in the light, and they are

usually not darkened by closing the lid of the seat. The users but rarely thoroughly cover up the contents. The door is more often open than closed. The building is near the kitchen, so the flies are permitted free access between it and the closets, from which they carry great numbers of harmful bacteria to the kitchen, where exposed foodstuffs are, and must leave these germs scattered on whatever they walk over. These facts are unpleasant to contemplate, but are not often considered. The prevention is easy if people would think, and impress upon children and others a habit they should themselves rigorously follow.

Diphtheria.

Number of cases reported ...	1,221
Mortality 81.—Percentage total deaths ...	3.04
Per 1,000 population ...	.29

Notified Places.

Metropolitan Area	518
Agricultural Areas	361
Goldfields	342

The bulk of cases notified came from Perth, Fremantle, Northam, Geraldton, York, Kalgoorlie, and Meekatharra.

This shows a wide distribution, and has caused considerable interference with school life. In many isolated places and where population is scattered, assistance has been rendered by the Central Health Department. One of the Medical Officers, Dr. Cumpston, or a qualified nurse from the Department, has gone and acted with the local medical man, where there is one, or alone in other parts, and carried out complete measures for the control of the outbreak.

Where no resident medical man was available, antitoxin was administered by the nurse to each detected carrier.

The measures included examination by swabbing of a large number of the inhabitants. Wherever a clinical case or a carrier was detected the whole household was immediately isolated and kept so until everyone was found to show two consecutive negative results. During isolation, treatment by spraying the throat of each affected person was carried out daily by the nurse.

Before the household was released, disinfection of all articles was carried out as far as was practicable.

All swabs from suspected cases are examined at the Health Department laboratory for anyone *free*.

This disease was first mentioned as occurring in this State in the sixties, and caused death from time to time, but outbreaks were not of any serious character.

During the last five years it has been epidemic in one or other parts. It has occupied much time of the officers of the Health Department, both by the travelling and controlling at different parts, and the examination of a large number of swabs, so as to interrupt work in other directions, such as systematic examination of school children, which had been taken up. Such opportunities as offered were availed of by Dr. Cumpston to go through the schools in the vicinity.

Although certain animals are known to be attacked by diphtheria, the chief cause of spread is by personal contact. The presence of the bacillus in apparently healthy individuals is undoubted, and ranges from 5 to 20 per cent. These carriers convey the bacillus to those who are in a receptive state, and unless detected, isolated, and treated, may account for many cases. Some of those who have had the disease may retain the bacillus in the throat, nose, and other parts for some months and be the cause of fresh cases.

In all cases treatment should continue until two consecutive swabs show negative results.

Phthisis.

Number.—Males	120
Females	68
	188

Percentage total deaths, 6.95 per 1,000 population, .68. Other tubercular diseases, 43. Percentage total deaths, 1.60 per 1,000 pop., 145. From all forms of tubercular disease there died in this State 231. From all causes, 2,706, which is equal to 1 in every 11.

The number suffering in proportion to those who died has been differently computed by observers as from ten times to twice, but a mean of these figures seems reasonably accurate. What does it mean to this State, where 1,500 of the inhabitants are in some stage of this disease, especially when it is the young who are afflicted and those approaching middle life who die?—

In males between 25 and 45; in females between 20 and 35.

They are either bread-winners, or have the responsibility of a family to look after, and where another twenty-five to thirty years of useful citizenship may have been possible.

There is also the risk that many are the active sources of infection to others. From close investigation made in this Department by Dr. Cumpston, during the last three years, 33.8 per cent. can be fairly traceable to infection from human beings.

The early recognition and treatment are of first importance, as it gives the afflicted the best chance, and the danger of infection to others is removed.

Many cases of tubercular infection are discovered *post mortem*. These cases have had sufficient resistance to limit the infection, suppress and destroy it, but it may be that continued exposure or an unusually large dose may exhaust the inherent power of the body, and this is likely to occur where the actively tuberculous patient is in close contact with those whose heredity may be a predisposing cause.

Hence the necessity for strenuous efforts to wipe out the scourge from our midst, and it should be individual and collective: Government, societies, combinations, and individuals. It will be a financial success, for it is to the State's advantage to keep people alive and healthy.

Benefit societies' funds are depleted by calls of sick members suffering from tuberculosis. This view has been made the subject of a memorandum to lodges throughout the State.

The feeling in this direction was so strong that towards the end of last year the Government decided to have a Royal Commission appointed to make investigations as to the extent of miners' phthisis.

This Royal Commission has for its object, according to the terms of reference—

(*a*) The prevalence amongst miners of pulmonary diseases; (*b*) the nature of such diseases; and (*c*) the extent to which they are associated with or consequent on mining.

The necessity for combined action is recognized in other parts of the world.

Scarlet Fever.

During the year there were 340 cases of scarlet fever notified in the State. The chief weeks producing this total occurred in the second, third, and fourth, and the 45th, 46th, 47th, 48th, and 49th weeks of the year. There was then a slight decline until the last week in the year, when a further rise took place.

One hundred and twenty-nine of these cases occurred in the Metropolitan area, 43 in the country districts, and 168 in the Goldfields area, chiefly Kalgoorlie and Boulder.

Measles.

Measles is not a notifiable disease, but there has been a considerable visitation of it in different parts of the State most of the year. The number of cases is impossible to ascertain. The deaths reported from this scourge during the year were nine.

The ages of the deaths are as follows:—

Between 6 and 12 months	2	cases
Between one and two years	2	,,
Between two and three years ...	1	case
Between five and ten years	1	,,
Between thirty and thirty-five years	1	,,
Between thirty-five and forty years	1	,,
Between fifty and fifty-five years ...	1	,,
Total	9	cases

The climatic conditions here are quite favourable to there being a low death-rate in this complaint when it only attacks young children.

There are many months (about 8) of sunshine, which limits to a large extent the lung complications which are so often the cause of fatality in colder, wetter climates.

Whooping-cough.

Whooping-cough has also occurred during the year, and is a continuation of the outbreak which has been present here for some years.

It has caused three deaths, the ages being

Between one and two years ...	2 deaths
Between two and three years ...	1 death
Total ...	3 deaths

Dysentery.

Dysentery caused the death of 19 persons. This complaint is as a rule sporadic. Cases occur in different parts, and are often the cause of death amongst children in outlying districts, where treatment is not understood, appropriate dietary is not obtainable, and where medical assistance is not available.

Chicken-pox.

Chicken-pox has also been present in many parts during the year.

Influenza

is a frequently recurring complaint. The periods of the year during which it is most troublesome are the late autumn and the early spring. It accounts for 24 deaths.

Plague.

Fortunately there has been no local outbreak of plague in this State since 1906.

Two cases were imported into the Port of Bunbury by a vessel seventeen days out from Bombay and Madras. The patients recovered, and the fumigation of the vessel by the Clayton process when she was loaded resulted in 40 rats being found, of which seven were infected with plague.

Precautions continue to be taken by the respective local authorities in the destruction of rats, and large numbers of baits are laid in the principal parts and observations taken from time to time as to the prevalence of rodents.

In Perth there have been 36,379 baits put down for the year, 13,202 taken, and 2,252 rats caught.

In Fremantle there have been 31,587 baits put down for the year, 6,990 taken, and 392 rats caught.

The difference in the number of rats caught in Perth and Fremantle can be somewhat accounted for by the fact that in Perth the dead bodies of rodents are paid for and in Fremantle they are not.

Close investigations of dead rats caught are constantly made, and during the year no plague-infected rat has been discovered other than those above referred to.

Erysipelas.

A notifiable disease. Forty cases were reported and one death.

Septicæmia.

Fourteen cases were notified, of which nine were puerperal.

Beriberi.

One hundred and twenty-nine cases were reported, all from Broome. This town is the headquarters of the Pearling Industry in the Nor'-West, where a large number of boats are annually congregated in this work. This disease is the chief cause of sickness amongst the coloured crews, who are chiefly Japanese, Malays, and Manillamen.

Although no deaths from beriberi appear to have been reported, yet from diver's paralysis nine deaths were notified. This paralysis has been very carefully thought out by the late District Medical Officer, Dr. Blick.

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(continued).

His view of these cases is: "That there is a certain teasing of the spinal cord about the fifth cervical vertebra. It looks as if one had stippled this with a fine knife or needle. With this condition is nearly always associated hæmorrhage of greater or less extent, and although the divers started about March 4, no paralysis occurred before September, and then to the end of the working season (November) cases came in almost daily.

"It is difficult to elucidate the cause of this, but in an autopsy, signs of scurvy were found. There is a simple explanation of this amongst men who live for months on small boats, eating salted and tinned foods, till the blood-vessels have been somewhat weakened, as we know happens in scurvy. Acting on this knowledge, I preached an anti-scurvy crusade, and noticed in fleets where my advice was taken and extra vegetables and other precautions used, there was a very considerable reduction in the number of cases of paralysis."

Small-pox.

One death from small-pox occurred, which was an imported case landed at Broome from a vessel coming from Singapore.

This vessel caused a further outbreak, but the cases were segregated and treated at Fremantle.

This disease was also introduced into the Port of Bunbury by a vessel from Calcutta.

No spread from either of these sources resulted.

Leprosy.

An occasional case of leprosy has been discovered in this State chiefly amongst Asiatics in past years. In August a case was discovered by the Acting District Medical Officer at Roebourne, and was confirmed bacteriologically. Another case was found in the 45th week, one in the 50th week, and another in the 52nd week.

Although no deaths occurred during the year, some of the cases proved fatal shortly afterwards.

All the above cases came from the same portion of the Roebourne district.

It is difficult to account for the origin, but it is reported that a Chinaman, who was a cook on one of the stations, was known some years ago to have a certain skin disease, which was remarked upon by men seeing him, in a jocular manner, that he (the Chinaman) was "turning into a white man." Whether this was so and caused the disease to occur amongst natives is hard to say, but it must have had some such starting point.

At present these cases are segregated on a Peninsula, and are being looked after.

Malaria.

Malaria is prevalent north of the 20th parallel. No cases have been known to arise south of this, although the anopheles mosquito has been found in these parts. From malaria, four deaths occurred.

The Kimberley is really a malarious region, having heavy tropical summer rains, bringing down rivers in flood for some time, and afterwards consisting of pools and lagoons, which form good breeding grounds for mosquitoes.

Instructions have recently been issued to Local Boards of Health, and if action were taken good results would ensue.

Dengue

Is an epidemical outbreak in the hot parts of this State, and causes considerable suffering, but no deaths.

Venereal Diseases.

This class of disease is one which the public scarcely realize the ravages which it causes, in its different forms. Unimagined disaster follows in its train.

There is no other form of disease which is so baneful in its results and by which others are doomed to suffer innocently.

The knowledge of the disease is common; its eradication most difficult, its havoc is appalling, and the sufferers are condemned to long periods of anxiety and ill-health.

No other disease is more inimical to the public health, and its ramifications deteriorate the stamina of the nation.

Good results are likely to be obtained by more general knowledge of the serious consequences of these diseases.

The diminution of these will ensue if free treatment is afforded at hospital to all voluntarily seeking relief, who declare their inability to pay. To effect this, strict privacy for patients must be the rule.

It is especially necessary to teach young men that chastity and continence are not injurious, but that these virtues are necessary and beneficial.

Naturally the only absolute prevention is purity of living.

Maternity.

There were born 7,601 children, and the deaths of mothers recorded were 46.

In 1899, it was one death in 165.2 births. In 1898, it was one death in 143 births. In 1897, it was one death in 167 births.

One-fifth of these at least are notified as due to puerperal septicæmia.

It unfortunately becomes public knowledge each year that certain deaths occur through illegal operations and unskilled interference, coupled with disregard of the cleanliness necessary to safeguard the patient from infection through dirt and carelessness.

Ankylostomiasis.

Mining.—This industry is important and likely to be continued for many years in this State. With the immigrants coming in may be some who are from places where ankylostomiasis is common. It, therefore, is very necessary—

(1) For ordinary reasons of decency and cleanliness.

(2) To prevent the propagation of the trouble caused by ankylostoma, if it should be introduced, that every care be taken to provide plenty of sanitary accommodation for underground miners, surface workers, and others, and to see that regular and frequent removals take place, that each person quite covers with earth and uses a disinfectant after every use of the closet, that the accumulation be ultimately disposed of by burning or trenching, and that drinking water and food places be carefully protected from fæcal contamination.

Vaccination.

Only about 10 per cent. of those born in recent years in this State have been vaccinated; this should be a sufficient reason for trying to remedy such a state of things rather than of using it as an argument against the continuance of compulsory vaccination.

Alcohol.

Alcoholic consumption continues to account for an enormous outlay of money.

During the past four years it has been as follows: 1905, £9 12s. per head; 1906, £9 2s. 7d. per head; 1907, £8 8s. 5½d. per head; 1908, £8 3s. 6½d. per head.

The consumption of spirits, wines, and beer per year per head of the population between 1901 and 1906 was as follows:—

New Zealand.—Spirits, .785 gal.; wines, .144 gal.; beer, 9.309 gal.

New South Wales.—Spirits, .81 gal.; wines, .57 gal.; beer, 9.76 gal.

Victoria.—Spirits, .70 gal.; wines, .85 gal.; beer, 12.04 gal.

Queensland.—Spirits, .82 gal.; wines, .29 gal.; beer, 10.58 gal.

South Australia.—Spirits, .40 gal.; wines, .27 gal.; beer, 9.15 gal.

Tasmania.—Spirits, .53 gal.; wines, .27 gal.; beer, 9.15 gal.

United Kingdom.—Spirits, 1.17 gal.; wines, .66 gal.; beer, 29.5 gal.

Western Australia.—Spirits, 1.49 gal.; wines, 1.08 gal.; beer, 24.71 gal.

W.A., *1908.*—Spirits, 1.10 gal.; wines, .94 gal.; beer, 18.92 gal.

In the quinquennial period above quoted, we are far in excess of the other States in spirits and beer.

It is to be hoped that the decrease which is now taking place will become more rapid.

Milk Supply.

In 1908 the Central Board inaugurated the veterinary examination of dairy cows, and this was carried on by the Board with satisfactory results up to the close of that year.

The examination of dairy herds has been steadily prosecuted by the Stock Department, and a considerable number of cows have been eliminated.

The inspection of dairy premises by the inspecting staff of the Central Board and by the various local authorities has been continued, and generally speaking these premises are found in a creditable and sanitary condition, and show a marked improvement upon the conditions of a few years ago.

The Local Boards of Health are responsible for safeguarding the purity of the article supplied to the consumers. This duty is carried out in many cases with commendable regularity, but in remote parts where analysts are not available it is more difficult and almost impossible to take any such steps.

The following points are useful in the sterilizing of milk:—

(1) Use a double milk saucepan. If this cannot be obtained, put the milk in an ordinary covered saucepan, and place it inside a larger vessel containing water.

(2) Let the water in the outer pan be cold when placed on the fire.

(3) Bring the water to the boil, and maintain it at this point for four minutes, *without removing the lid* of the inner milk pan.

(4) Cool the milk down quickly by placing the inner pan in one or two changes of cold water, *without removing the lid.*

(5) When cooled down, aerate the milk by stirring with a spoon.

In all circumstances it is most advisable that every vendor of milk should have it kept cool and served to all customers in bottles instead of by open means. It would not cost much more.

Abattoirs.

In the metropolitan area private abattoirs are in use where all killing is done. At Kalgoorlie the same custom prevails, but here a large Government abattoir has been built.

At the commencement of the year under review there were but three inspectors on duty in the metropolitan area, but owing to an increase in the number of slaughter-houses in other parts of the area it became necessary for the Government, on the recommendation of the Board, to appoint two additional inspectors, whose duties comprised regular inspection of the slaughtering of the yards previously unsupervised.

The result of this increase in the metropolitan meat inspection service is that the whole of the slaughtering at licensed slaughter-yards is supervised, and the carcases carefully inspected with a view to the condemnation and destruction of all carcases or parts found to be diseased or unwholesome.

During the year power was given to the Central Board to make regulations providing for the branding of meat passed by its inspectors, and to levy charges therefor. The regulations came into force on August 1; a form of brand was decided upon and the following scale of charges made:—

For the carcase of every ox, cow, bull, heifer, or steer ... ... 6d.

For the carcase of every calf of 300 lb. weight or over ... ... 6d.
For the carcase of every calf under 300 lb. weight ... ... 1d.
For the carcase of every sheep, or lamb, or goat ... ... 1d.
For the carcase of every head of swine ... 2d.

It will be understood that the appearance of the Board's brand upon a carcase is a guarantee that at the time of slaughter the particular carcase was free from disease.

The quantity of meat which was inspected and branded in this manner amounted to:—

Cattle, 29,678; calves, 297; sheep, 198,638; pigs, 126,697.

While the whole of the slaughtering within the metropolitan area is subject to inspection, some meat enters the area, both by rail and road, from beyond the commonly recognized boundaries of that area. This quantity is comparatively small, but while any portion of the supply remains uninspected the position cannot be regarded as perfect.

In the country parts it is impossible, where small amounts are manipulated, to have inspectors, but each slaughter-house has to be licensed and the Local Boards of Health, where such exist, supervise their cleanliness.

Fish.

This is easily procured and is plentiful on our coast. It is a very necessary article of diet; one which would afford considerable variety and pleasure to the poorer classes, but which is almost out of their reach in consequence of the high prices charged. It may be that the fisheries are controlled so as to always keep up a fixed price, or that the catchment is not sufficient to offer to the general public at a price within their reach, but whatever the cause, the fact remains that it is a luxury even for the well-to-do.

Sanitation.

There is no system of sewerage anywhere, but one is in course of construction in Perth and Fremantle, which will take a considerable time yet before it is completed. This will be a great improvement upon the sanitation of these places.

A few private houses and some institutions are providing themselves with septic tanks. These give fairly satisfactory results when carried out in proper detail.

Laboratory.

A well-equipped laboratory is attached to the Central Board of Health, where all bacteriological investigations are made, both on behalf of the Board and private practitioners, for diagnostic purposes.

Tuberculosis and diphtheria specimens are treated free. For other matters and pathological work a scale of charges is in operation.

Colonial Medical Reports.—No. 16.—St. Vincent.

MEDICAL REPORT FOR THE YEAR 1909—1910.

By CYRIL H. DURRANT, M.B.,

Medical Officer, Kingstown District.

The estimated population of the Kingstown District, which comprises the town of Kingstown, is 5,000. There were 162 births and 81 deaths, giving a birth-rate of 32.4 per 1,000, and a death-rate of 16.2 per 1,000.

Sickness was more prevalent during the first quarter of the year under review, *i.e.*, from April to June, 1909; and this period also assumes the highest death-rate, pulmonary tubercle, and gastro-enteritis in infants, claiming the largest number of victims.

The relation of gastro-enteritis to the high infant mortality has been under consideration, and efforts have been made to educate the mothers and guardians of infants in the subject of "Infant Feeding" with the hope of reducing the high mortality. The method adopted consists in furnishing each mother or guardian, when registering the birth of an infant, with an attractively printed card, stating in simple words the way in which the infant should be fed; and endeavours to teach them to abolish the faulty and unwholesome diet that is administered to those of tender age.

It is gratifying to be able to note that the year under review was not marked by any general disturbing influences affecting the public health of the district. There was no disease of epidemic character present during the year. Catarrhal fevers and amœbic dysentery were prevalent during August, September and October, but they did not affect the death-rate to any material extent. Malarial fever was rather less common than is usual in the October-December quarter. Syphilis in its various manifestations, framboesia or yaws, and intestinal parasites (*Ascaris lumbricoides* and *ankylostoma duodenale*) are the conditions which the District Medical Officer is most commonly called on to treat. Pulmonary tuberculosis, already referred to, still claims its share of victims.

The sanitary condition of the district has been

satisfactorily maintained during the year. The principal streets and thoroughfares of the town of Kingstown have been kept in a fairly presentable state, and efforts have been continuously made by the Kingstown Board and its sanitary inspectors in anti-mosquito measures. The district immediately surrounding the town, however, deserves attention in a similar way; the Richmond Hill and Sion Hill quarters, which immediately overlook the town, being a fruitful source of supply of mosquitoes, owing to the habits of the villagers storing drinking water in open barrels, tubs, &c., and it is difficult to be able to suggest the remedy without being able to supply these villages with a proper and efficient water supply.

Vaccination has been regularly performed each week throughout the year, the total number of successful vaccinations recorded being 132. This number out of a total number of 162 births points to a satisfactory condition of protection against small-pox in the district.

REPORT OF THE MEDICAL OFFICER, No. 1 DISTRICT.

Population.—12,000 estimated.

Births.—141 to December 9, including Calliaqua; 68 after December 9, excluding Calliaqua. Total, 209.

Deaths.—65 to December 9, including Calliaqua; 39 after December 9, excluding Calliaqua. Total, 104.

From April onwards through the hot weather epidemic diseases of children and dysentery prevail.

During January and February there was more rheumatism to be treated.

During February and March there was a large number of irritative eye troubles caused by dust.

Relative Mortality in Different Seasons.—Quarter ending June, 32 deaths; quarter ending September, 20 deaths; quarter ending December, 22 deaths; quarter ending March, 30 deaths, showing approximately a 50 per cent. increase of mortality during the first half of the calendar year.

The following gives the *distribution of deaths for the different months:* April, 14; May, 6; June, 12; July, 9; August, 7; September, 4; October, 4; November, 9; December, 9; January, 8; February, 12; March, 10.

Since December 9 the only effect of weather noticeable has been the irritative effects of dust in dry weather on eyes, throat, and nose.

Gastro-intestinal diseases, including those caused by intestinal worms, are particularly prevalent.

Yaws and syphilis, widely spread, are the cause of most of the ulcers, and indirectly cause much disease, such as anæmia and debility. The primary diseases themselves are not a source of much concern to the patients. It would be difficult to say which causes most harm—yaws, syphilis, or intestinal worms as a class.

General Sanitary Condition.—Any place outside a house seems to be considered suitable for the deposit of excreta.

The houses in the villages are reasonably far apart, though the houses themselves are overcrowded.

There are few heaps of domestic rubbish about these houses.

There are comparatively few pools of water in and around the villages, except at Clare Valley, where a brackish lagoon probably keeps the numerous crab holes supplied with water; but the crab holes as well as the lagoon are at about sea level.

There are occasionally accumulations of rain water in grass-grown roadside ditches, but the latter are cleaned periodically.

Drinking water is obtained from rain barrels; springs are, however, preferred; streams also form a source of water supply, according as to whether they do or do not dry up in dry weather.

Stand-pipes are provided in some localities, and are much to be recommended. It would be most advantageous should it be possible to extend this mode of supply.

Forty-three vaccinations were certified successful.

During the four months I have been stationed in District No. 1 I have seen very little malaria.

That which I have seen has mostly been imported; for instance, severe cases of malaria occur in the island of Bequia; but the inhabitants constantly travel up and down the Grenadines to and from Grenada, spending the nights in all sorts of places, and developing "Grenada fever," as they call it, on their return.

The only other part of my district that has houses at sea level is Clare Valley; so far malaria has not been evident there. They expect it in the hotter weather, when, possibly, the heavy rains supply the crab holes with fresher water than that which filters in from the sea, thus affording a breeding ground for an Anopheline which prefers these holes —the *Cellia.*

Anophelines are rare in the district as a whole; surface fishes and water striders probably devour the larvæ. I have searched in the grassy edges of many streams, typical Anopheles breeding grounds, without finding larvæ.

The anti-malaria measure, accordingly, required in District No. 1 is to fill up crab holes, a task of very considerable magnitude considering the very slight incidence of malaria, most of which, as stated above, is imported.

Anti-mosquito Measures as applied to Stegomyia.

An Ordinance will shortly come into force with regard to harbouring larvæ in and about houses.

This should entail no hardship on those who use stand-pipes, deep well springs, and streams for their water supply.

For those who depend on rain barrels a rigorous system of inspection would be needed.

There is no doubt that stegomyia could be abolished in the more densely populated districts, and with them would go all danger from the importation of yellow fever. Yellow fever is mainly a town disease, and a few stray stegomyia in isolated houses outside towns and villages could practically be disregarded.

Colonial Medical Reports.—No. 16.—St. Vincent.— *(continued).*

Quarantine.—During my term of office no vessels were quarantined. The few passengers or crew reported sick by the captain of the vessel concerned were examined, and found not to be suffering from quarantinable disease.

In February one case of plague occurred in Trinidad; Dr. Durrant, during my absence in Bequia, fumigated two vessels on this account. These had not been fumigated at Port of Spain, as this was not an "infected port."

At the end of March Grenada was declared to be "infected" owing to an outbreak of small-pox; no vessels arrived from Grenada before April 1, 1910.

Venezuela has been considered "infected" for some time, but no vessels came from any port in that country.

Kingstown and St. Vincent have been "healthy" since my appointment. I have issued no bills of health.

H. B. Dodds.

Report of the Medical Officer, No. 2 District.

Population.—The estimated population of the district is 11,337.

The number of births were 342, and the number of deaths 155. Still-born children 19, giving a birth-rate of 30 per 1,000, and a death-rate of 13.6 per 1,000.

There is a good deal of sickness in this district, chiefly syphilis, yaws, dyspepsia, and intestinal parasites. During the rainy season malarial fevers and dysentery were more prevalent in certain parts, viz., the Buccament and Cumberland valleys.

The prevalence of any particular disease has not varied in the different seasons to a marked degree.

Relative Mortality in Different Seasons.—There is very little difference in the mortality during the different seasons. The quarterly returns were: To June 30, 40 deaths; to September 30, 38 deaths; to December 31, 41 deaths; to March 31, 1910, 37 deaths.

The mortality for each month during the year was as follows: April, 1909, 18; May, 11; June, 11; July, 10; August, 19; September, 9; October, 18; November, 6; December, 17; January, 1910, 10; February, 8; March, 19.

Malarial fevers and dysentery are endemic in several parts of this district, particularly the Buccament and Cumberland valleys, but during the rainy season the number of cases were increased. The cases of malaria were of a mild type as a rule, but some of the cases of dysentery were very severe.

Two cases of diphtheria occurred during the year, one case at Layou and one at Chateaubelair. The usual precautions were taken with regard to isolation and disinfection, and no fresh cases occurred.

Yaws, syphilis, and ulcers are common in the district. Ulcerous rhino-pharyngitis occurs in isolated cases, and is probably a late manifestation of severe syphilis. It is common in coolies of a poor class.

Ulcers of a specific and non-specific nature are common; they are generally in a bad state by the time they come for treatment. Progress is very slow, and treatment in the people's homes not satisfactory.

Enteritis in children, in most cases due to improper feeding, is commonly met with.

The general sanitary condition of the district is fairly good.

The number of successful vaccinations performed during the year was 282.

In the small towns of Layou, Barrouallie, and Chateaubelair a sanitary inspector was appointed for each town. His duty was to inspect the different houses and yards to see that no water was allowed to accumulate where mosquitoes might breed, and to report the result once a week to the Town Wardens.

A number of patients were sent from this district to the Colonial Hospital in Kingstown during the year. They were chiefly cases of chronic ulcers and diseases requiring proper diet and nursing, which they were unable to get in their homes.

The number of deaths in children under two years from gastric and intestinal diseases is high. This is due in a good many cases to improper food, and treatment is very unsatisfactory owing to the difficulty of getting the people to carry out instructions, &c.

Thomas H. Massey.

Report of the Medical Officer, No. 3 District.

Population.—The estimated population of this district is about 10,000. No census has been taken for about 20 years, and, therefore, any figures giving the proportion of births and deaths per 1,000 are not reliable.

The total births for the year were 398, 198 legitimate and 200 illegitimate. Of the 15 still births, 9 were legitimate and 6 illegitimate. Assuming that the total population for the district is 10,000, this gives a birth-rate of 39.8 per 1,000.

The population can be roughly calculated from the birth-rate, which is usually about 36 per 1,000 amongst the people of these islands.

The total deaths for the year were 147, which gives a rate of 14.7 per 1,000. 94 of these were deaths of children under 5 (=64 per cent.). 69

were deaths of children of one year and under (=47 per cent.); 15 of these 69 deaths were still-births. A coolie woman died aged 105. In 56 of the 94 children under 5 the cause of death is given as gastro-enteritis, or diarrhœa, probably caused by bad feeding, ignorance and neglect, or teething. In 4 of the total of 147 deaths no cause was given. Presumably, these cases were reported to the Coroner.

According to the report of the Registrar-General for Jamaica for the year ending March 31, 1909, the figures were: Birth-rate 37.6; death-rate 22.4 per 1,000. 29.4 per cent. of deaths were those of children under 1, and 42.2 per cent. were those of children under 5. In 76.6 per cent. of the deaths the cause was not medically certified.

The Barbados death-rate is given as 29, British Guiana 36.9, Antigua 29.98, Trinidad 22.6, Bermuda 18.7, St. Vincent, 18.34, St. Lucia 19.4.

In London, for the first quarter of 1910, the birth-rate was 24.5 per 8,000; death-rate 14.3 per 1,000; the average for 10 years, 18.4 per 1,000.

Infant mortality, measured by the proportion of deaths amongst children under 1 year to registered births, was 101 per 1,000.

In 76 of the largest English towns for the first quarter of 1910, 0.8 per cent. of the deaths were not certified either by a registered medical practitioner or by a coroner.

In Birmingham the proportion rose to 3.4, in Preston 4.4, in St. Helens 5.2, and in Gateshead 5.5. (Extract from the *British Medical Journal Supplement.*)

From the figures given, the infant mortality of this district, measured by the proportion of deaths of children under 1 year (69) to registered births (398), was 173 per 1,000; and 8 per cent. of the deaths were not medically certified. This is generally due to the fact that the doctor is called at the last moment, and the patient dies before he arrives.

This district, on the whole, is healthy, and the only serious diseases which appear to visit it are dysentery, malaria fever, gastro-enteritis or diarrhœa, and yaws. Generally speaking, the prevalence of sickness depends on the rainfall. After rain, one may expect dysentery and diarrhœa, and, in dry weather, malaria fever. Pools flushed by rain in wet weather breed mosquitoes in dry weather.

Yaws is endemic, and cases could be found in most villages, but they are never brought to the doctor, and do not appear in the returns. According to these, there were 4 cases of dysentery in April and May, and three cases in June and December, 1909, and January, 1910. Malaria fever showed 3 cases in December, 1909, 4 in January and March, and 7 in February, 1910. An outbreak of yaws occurred at Argyle in September, 1909; there were 7 cases. Diarrhœa and worms head the list of diseases.

The deaths were distributed as follows:—

April 23, May 11, June 11, July 14, August 14, September 8, October 8, November 14, December 15. 1910.—January 5, February 13, March 11.

Cases of malarial fever are few and far between. They are usually of a mild character.

Tuberculosis is also rare, but is usually imported, and always fatal.

Yaws.—Cases are concealed in the villages, and rarely come to the doctor. It is futile to attempt to deal with yaws until a place is provided where these contagious cases can be compulsorily sent.

Syphilis is prevalent, but apparently not so bad as in Kingstown and the Leeward District.

Ulcers are numerous, mostly untreated, and usually due to syphilis or yaws.

Dyspepsia is common, as is to be expected from the amount of starchy and badly cooked food eaten at irregular hours.

Owing to their poverty, women feed their children on arrowroot or " what they have " instead of milk; the result is a high infantile mortality of *gastro-enteritis.*

There are two chief kinds of *worms*, the common round worm, which 90 per cent. of the children have, and the hook-worm, causing ankylostomiasis, of which the chief symptom is anæmia from loss of blood. Comparatively few ankylostomiasis cases have been met with in this district.

A simple test for ankylostomiasis is to pull down the lower eyelid and notice if the inside is red or white.

Schoolmasters should send all children with sores or white eyelids to the medical officer at once, and on no account allow them to attend school, for they are contagious.

The general sanitary condition of the district is good.

There were 194 successful vaccinations during the year. The total births were 398, so that apparently 204 children have escaped vaccination in this district. Some died before vaccination.

The bush was kept cut in the villages, and the sand bar at the mouth of the river at Calliaqua was cleared when required. Most houses in these villages have uncovered water butts, which breed plenty of mosquitoes. In the absence of any law providing a penalty for harbouring mosquito larvæ, it is difficult to see how this state of affairs can be remedied. This district cannot be regarded as malarious, except at a few places such as Calliaqua.

In Antigua, certificated nurses, trained at the

Government Hospital, were appointed to the various villages, and proved most able assistants to the Medical Officer. A similar arrangement can be made here, as the Government provides free training and outfit at the Colonial Hospital for suitable candidates, who, after five months' instruction, are duly examined by the Medical Board and given certificates.

The women in the country districts run considerable risk when not attended in their confinements by trained nurses. The penal clause of the English Midwives Act of 1902, which came into force on April 1 last, provides that "any woman acting (as midwife) without being certificated shall be liable, on summary conviction, to a fine not exceeding ten pounds, provided that this section shall not apply to legally qualified medical practitioners or to anyone rendering assistance in case of emergency."

G. B. MASON.

REPORT OF THE MEDICAL OFFICER, No. 4 DISTRICT.

Population.—Estimate 12,000.

Births.—30. Still-born, 4.

Deaths.—26.

Having been in this district for so short a period, as far as I can judge the season has been normal with regard to health.

The number of deaths certified by me were distributed as follows:—

December, 7; January, 7; February, 5; March, 7. Total, 26.

During the period under review the weather was dry with occasional showers. In the early part of March the sun was very hot, with a cold breeze from north-east. This caused several cases of bronchitis and allied throat affections.

Ascaris was the most common complaint treated, 149 cases being treated.

Gastro-enteritis or infective enteritis was also frequently met with, 34 cases with 10 deaths. One case of infantile convulsions was treated with success.

Amongst adults, 50 cases of dyspepsia were treated. No deaths. 41 cases of ulcer were also treated. 12 cases of amœbic dysentery were treated, with 4 deaths. These cases did not occur as an epidemic, but were isolated cases from different parts of the district and at different periods. 10 cases of inflammation of the conjunctiva and cornea were treated; these were in my opinion due to the dust. 26 cases of old age were treated with 3 deaths. There was one case of accidental poisoning from an excessive use of iodoform on ulcer, not under medical advice.

General Sanitary Condition of District.—The sanitary condition of the district was satisfactory. I found no difficulty in getting the owners of the property to obey my directions.

The number of successful vaccinations was 50. The lymph and the supply were both excellent.

There were no cases of malaria or other mosquito-borne disease met with, nor did I hear of any such cases having occurred in the district. The district is generally a healthy one. In some parts the villages are rather overgrown with bread-fruit trees and banana plants, but the health of the inhabitants appears about the average of the rest of the district.

P. GRAY-MARSHALL.

REPORT OF THE MEDICAL OFFICER, No. 5 DISTRICT.

Population.—The estimated population of No. 5 District may be said to be 7,500. The number of births for the year was 161, and the number of deaths 51. The birth-rate per thousand was 21.4, and the death-rate 6.8.

Regarding the prevalence of sickness in the different seasons of this year influenza broke out in the month of April. The cases were very few and mild in type, and responded readily to treatment; many of the cases began in the previous month and lasted on to April. Also in the months of December, 1909, January and February, 1910, a few cases of influenza occurred, most of them having resulted in a bronchitis, but none eventuating fatally.

I am glad to mention that while yellow fever and plague were in neighbouring islands this district was quite free of these epidemics. Passengers who arrived from infected ports were subjected to strict surveillance, and no case was found to exist here. There was nothing of an epidemic nature. No zymotic disease occurred.

Throughout the district or districts that I had charge of, among children, diarrhœa, intestinal parasites, and congenital syphilis were the chief ailments and the chief causes of death.

This diarrhœa of the infant was in most cases attributed to and found to be the result of the injudicious and improper feeding of the infants by the mothers.

Intestinal parasites, too, were the results of the unclean way the mothers kept their children, and the ignorance of and disregard for hygiene.

In the adult the cases which commonly came to me for treatment were those of dyspepsia, uncinaria, valvular disease, Bright's disease, anæmia, rheumatism, debility, chronic tertiary syphilis, gonorrhœa, bronchitis, ulcers, and some other ordinary constitutional disorders.

Chronic tertiary syphilis, the commonest if not the only form of this disease met with in the district, enters largely in the monthly Returns; and in this district and colony this is a common ailment

among the labourers. The primary syphilis or hard chancre was seldom, if ever, brought to my observation.

A few cases of pulmonary tuberculosis were treated; some of them ended fatally. Here I may mention a disregard many have for hygiene observances—chiefly overcrowding and exclusion of fresh air.

Malaria fever is almost unknown in this district. About half a dozen cases were treated which seemed to have been of a chronic type.

Some cases of tetanus were treated among infants, and most of them ended fatally. This condition is found in the newly-born, and traced to the ignorance and gross negligence of the so-called midwives of this colony.

The following is the distribution of deaths in the different months, and this also includes some in the No. 4 District: May and November, each month, 14 deaths; October, 11 deaths; July, August, September, March, 10 deaths in each month; April and December, in each month, 8 deaths (No. 5 District); September, 7 deaths; January, 4 deaths; February, 4 deaths.

During the year there were frequent downpours of rain which constantly threw the roads of this district out of order; the road to Owia and the Fancy having been impassable on occasions.

Beyond a few cases of influenza which occurred at different times of the rainy season, and a few cases of malaria, there is no particular disease which occurred during the year.

The general sanitary condition of the district was excellent, and so was that of No. 4 District during the time I acted there.

Georgetown, the chief town on the Windward coast, may be regarded as a very healthy place. It is provided with an excellent water supply, and is always kept in a clean and sanitary state.

The sanitary conditions are good. Generally throughout the district the inhabitants depend on their water supply from the large and voluminous rivers which flow in most parts of this district.

The water proved wholesome. There were no cases of dysentery; but there were a very few cases of diarrhœa.

The number of vaccinations successfully carried out was 118 in the No. 5 District, and 125 in No. 4 District. The lymph supplied was good, and gave satisfactory results.

P. F. Cremona, M.B., Ch.B.

Report of the Medical Officer, No. 6 District.

This district consists of the Southern Grenadines, the three chief of which are the islands of Canouan, Mayreau, and Union, and the medical attention they receive consists of quarterly visits. These are really visits for inspection and vaccination, as the interval between the visits (three months) is too great to permit of anything like adequate medical relief to the patients in these islands. I regret to say that these quarterly visits were not regularly possible during the past year owing to hard pressure of work consequent on an epidemic of enteric fever in Carriacou. This failure, however, applies only to Canouan, as Union and Mayreau received weekly visits for a limited time, and this on account of enteric fever in these islands.

Population.—The population is estimated at about 1,600 souls, and the social and sanitary conditions are of the most primitive. Each island is owned by a single proprietor.

Notwithstanding the entire absence of any sanitary measure, these islands are very healthy and enjoy a remarkable immunity from diseases, which are endemic in the neighbouring islands, *e.g.*, malaria fever, dysentery, &c.

The outstanding feature of the year was an outbreak of enteric fever in Union and Mayreau; fourteen cases occurred, each of which was removed and treated in the Carriacou Hospital, and the house and surroundings of the patient at once efficiently disinfected.

The disease was most severe in the village of Ashton, Union Island, and knowledge of the sanitary conditions of this village, which can only be described as "huddled terraces of filth," compels one to attribute the stamping out of the disease to the mercy of Providence.

At one time the whole island stood in imminent danger, in that the only shopkeeper of the only shop died somewhat suddenly of enteric fever in the building in which the shop is kept. However, it is gratifying to record that efficient disinfection and other precautionary measures were at once adopted with satisfactory results.

As to the source of the disease there can be no doubt that infection was introduced from Carriacou, where an epidemic prevailed almost throughout the year.

That water played no part in the further spread of this disease has been fully demonstrated, as the chief source of water in Ashton Village is from a very filthy well which is quite unprotected from contamination; how filthy the well was may be proved by the fact that cleaning out the well and purification with permanganate of potash raised a violent storm around my person, the older inhabitants declaring that the well had not been cleaned for seventy years, and the present innovation was a menace to the lives of the inhabitants. The well was effectually cleansed.

No disease calls for particular mention.

Dunbar Hughes, M.B., C.M.

Colonial Medical Reports.—No. 17.—Fiji.

MEDICAL REPORT FOR THE YEAR 1909.

By G. W. A. LYNCH,

Chief Medical Officer.

THE estimated population of the Colony at the end of 1909 amounted to 133,831, and was made up as follows:—

Race.	Males.	Females.	Total.
Europeans and other whites ...	2,060	1,333	3,393
Aboriginal Fijians	45,659	41,731	87,390
East Indian immigrants (including their children born in Fiji) ...	23,067	12,339	35,406
Melanesian immigrants ...	2,639	365	3,004
Natives of Rotuma	1,047	1,150	2,197
Half-castes and other degrees ...	946	908	1,854
All others	344	243	587
Total	75,762	58,069	133,831

These figures show an increase of the total population during the year of 2,765, of whom 1,557 were males, and 1,208 were females.

There is an increase in all races except Rotumans; it is difficult to account for the apparently very small increase in the European population, except that at the end of the year there is apt to be a large exodus of Europeans to more temperate countries, and that this exodus may have been larger in 1909 than usual; the increase among Fijians is appreciable.

Particulars of births, deaths, and marriages which took place among the various races are shown in the table below:—

Races and Nationalities.	Births.			Deaths.			Marriages.
	M.	F.	Total.	M.	F.	Total.	
Europeans	49	44	93	23	12	35	39
Fijians ...	1,736	1,732	3,468	1,653	1,539	3,192	987
Indians ...	702	667	1,369	343	235	578	424
Melanesians	7	13	20	34	3	37	7
Rotumans...	46	47	93	47	55	102	30
Half-castes	41	34	75	11	4	15	17
Others ...	3	1	4	1	3	4	12
Totals	2,584	2,538	5,122	2,112	1,851	3 963	1,516

The total number of births registered exceeded those in 1908 by 214; the registered deaths were 106 fewer. The marriages registered show a considerable falling off, being 180 fewer than in the previous year. The birth-rate calculated on the mean total population for the year was 38·19 per mille, against a rate of 37·79 for 1908, and the death-rate was 29·61 against 31·39 in the former year.

SEASONAL PREVALENCE OF DISEASE.

The subjoined table shows the number of admissions to the Colonial Hospital during the year; the admission rate for the twelve months of 1909 is higher than that for 1908, the highest quarter being, as is usually the case, the first quarter of the year, and the lowest the third.

Europeans	194
Fijians	597
Indians	790
Melanesians	174
Others	68
Total	1,823

The number of admissions to the seven provincial hospitals and the native hospital at Rotuma were 3,236, the number of deaths 86, being 23·5 per mille.

ENTERIC FEVER.

There continues to be cases of enteric fever in some of the out-districts, and more of these cases are found in the Rewa district and its surroundings than elsewhere. The spread of the disease is favoured by the presence of small free coolie settlements with insanitary surroundings, poor water supply, and latrine accommodation of the most primitive character, and the consequent need for sanitary inspectors in some of the larger of the coolie districts is shown to be great. Hitherto, however, it has not been found possible to provide these inspectors, and it is to be feared that until they are provided, such preventable diseases as enteric fever, the spread of which is due to the dirt and ignorance of Indians and natives, must remain a menace to the general health of the community.

In the free coolie settlements it is a matter of extreme difficulty to enforce sanitary regulations, the inhabitants seldom use latrines (in any case, these would be of the cesspit order), but prefer to use the surrounding scrub as a latrine. This applies to both Indians and Fijians, though in the case of the latter efforts have been, and are being made, to compel the erection and use of a simple form of latrine. It is hoped that when the new Public Health Ordinance comes into force it will be found possible to appoint two, or perhaps three, of these district sanitary inspectors to work under the district medical officers and give them early notice of cases of infectious disease, so that early and proper isolation precautions may be taken.

Thirteen cases were treated in the Colonial Hospital with one death. In every case these patients were brought into Suva from an outside district, most of them being from the Rewa.

DYSENTERY.

A total of 305 cases of dysentery were treated during the year at the Colonial Hospital with 25 deaths; a total of 191 cases at the provincial

hospitals, with 31 deaths; and 583 cases, with 16 deaths, at the plantation hospitals.

The varying mortality rate may be explained in the case of the provincial hospitals at any rate by the fact that the natives are most unwilling to bring their acute cases for treatment, and when they do bring them they, in many cases, do so too late for any good results to be expected.

With regard to the dysentery in Suva, a vast number of the cases are brought to the hospital from the gaol—Indian and Fijian prisoners for the most part. Much attention has been given to the sanitary conditions at this institution, and increased precautions have been taken to keep latrines protected from flies, but cases keep presenting themselves in spite of all precautions, and it is well known to all medical officers who have worked at the gaol that Indian prisoners constantly make up dysentery stools or maltreat themselves in order to escape work; one man was recently discovered who was feeding himself with powdered glass to bring about bowel irritation.

A new gaol is to be built in the near future, and with it a new gaol infirmary, where all prisoners will be treated instead of at the Colonial Hospital. At these new institutions increased care is to be taken to make all sanitary arrangements as perfect as possible.

With regard to the statistics of this disease in the provincial hospitals, it can only be said that, as an indication of the prevalence of the disease in the out-districts, they are almost worthless, for it is known that not one-tenth part of the cases in any district among Fijians apply to their hospital for admission.

The low mortality at the coolie (plantation) hospitals may be considered to be due to the fact that employers, in most instances, from daily inspection of their labour have early knowledge of any case and send it promptly to hospital.

Tuberculosis.

This disease continues to bring large numbers of patients to hospital. The returns show how wide are its manifestations in all parts of the Colony. Tubercle of lungs, however, predominates. The cases shown as treated do not indicate, however, the true case incidence nor the true mortality rate; for, as regards the case incidence, all cases are not seen or brought to hospital, and as regards mortality, cases at the point of death, or thought to be so by relatives, are removed to their own houses.

During the year a simple circular was drawn up in Fijian showing the main causes of the spread of the disease, in the simplest language. This was very widely circulated through stipendiary magistrates, district medical officers, and all native officials to all native villages, and it is hoped that some good may result from its wide distribution; but here, as in all other matters of hygiene, even the simplest question of overcoming the native prejudice against civilized methods is the main difficulty, and gradual education through the younger and now better educated Fijians is what must be looked upon as the great aid to breaking down native superstition.

Influenza and Dengue Fever.

Both influenza and dengue fever continue. The hospital returns do not by any means indicate the number of cases of either disease; for, especially in the outside districts and those at a distance from a hospital, few of these cases seek admission to hospital. In the towns, dengue may be considered to be endemic, attacking for the most part the new-comers, who in some instances suffer severely. The type of dengue fever in Fiji may be considered severe, lasting in some instances from eight to nine days, and being in some cases so severe in character as to be easily mistaken for enteric fever when about eight days in duration; then all the symptoms suddenly abate, leaving a condition of debility with slow pulse which is very typical and often prolonged for a week or more.

Tinea Imbricata.

More systematic efforts at dealing with this disease are now being made. In many districts regulations compelling those affected to go to hospital are in force, and in some of the provincial hospitals there is a constant flow of these patients. The methods employed in treating the disease vary. Baths and chrysophanic acid ointment easily cure these cases not of long standing; iodine in various forms is also used. Both of these methods of treatment, however, are expensive, and it is doubtful whether they are more effective than the cheaper method of sulphur fumigation. In this latter, the benefit of which is much appreciated for cases of long standing, the patient is confined in a box, with his head only exposed to the air, a fumigating arrangement is introduced in a part of the box under the seat on which the patient sits, and his whole body inside the apparatus is exposed to the sulphur fumes several times weekly. This method appears to have far better results in all cases of long standing, and in those cases which have been treated for many months by iodine and ointment without appreciable result, the benefit has been most marked. To ensure non-recurrence, it would be ideal to prevent those cured from returning to their infected dwellings, which should be burnt with all that they contain in the way of clothing and mats —but that would be a difficulty.

Frambœsia or Yaws.

Large numbers of patients suffering from this disease are treated at the Colonial Hospital and at all the provincial hospitals. For the secondary and tertiary manifestations, 225 cases were treated at the Colonial Hospital and over 800 at the provincial hospitals, the latter out of a total admission list of 3,200. This is a disease which it is hoped may be eradicated in time, and patients suffering from the disease are compelled by local law to go to hospital or take their children to hospital for treatment; but the cases in distant parts of provinces are not easily caught, especially when they

Return of Diseases and Deaths in 1909 at the Colonial Hospital and in Fiji.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	10	—	10
Anæmia	—	—	—
Anthrax	—	—	—
Beriberi	—	—	—
Bilbarziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	4	1	4
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	—	—	—
Enteric Fever	—	—	—
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	—	—	—
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	—	—	—
Kala Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	6	—	7
Malignant	8	2	8
Old Age	—	—	—
Other Diseases	—	—	—
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	—	—	—
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	—	—	—
(*a*) Primary	—	—	—
(*b*) Secondary	—	—	—
(*c*) Tertiary	—	—	—
(*d*) Congenital	—	—	—
Tetanus	—	—	—
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tuberoular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	137	—	138
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	33	1	34
(*b*) Other Diseases	8	—	8
Digestive System—	—	—	—
(*a*) Diarrhœa	47	1	48
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	4	—	4
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	5	3	6
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	3	—	3
(*g*) Cirrhosis of Liver	3	1	3
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	65	1	66
Ear	19	—	19
Eye	63	—	64
Generative System—	—	—	—
Male Organs	51	—	53
Female Organs	26	—	26
Lymphatic System	26	1	27
Mental Diseases	—	—	—
Nervous System	28	2	30
Nose	12	—	12
Organs of Locomotion	29	—	29
Respiratory System	139	8	131
Skin—	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	9	—	10
(*d*) Favus	—	—	—
(*e*) Eczema	5	—	5
(*f*) Other Diseases	26	—	27
Urinary System	11	1	11
Injuries, General, Local—	76	—	86
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	20	—	20
Ascaris lumbricoides	8	—	8
Oxyuris vermicularis	1	—	1
Dochmius duodenalis, or Ankylostoma duodenale	38	8	40
Filaria medinensis (Guinea-worm)	17	—	17
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	1	—	1
Metallic Poisons	1	—	1
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	15	1	15
Surgical Operations—	211	—	211
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	1	—	1
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	1	—	1

are in young children, and there can be no doubt that unnecessary exposure to infection causes many children to be inoculated with the disease, and brings about many preventable deaths in infants.

Leprosy.

The isolation station for lepers is still in use pending the opening of the large leper station at Makogai Island in the centre of the group. The number of lepers at Beqa is small; they average about thirty of all races—European, Fijian, Indian, and Polynesian; but the station is but a small one and it is impossible to accommodate the numbers that we wish. The law for compulsory segregation is therefore not yet in force.

With regard to the station at Makogai, but small progress was made in 1909 with the work there. In order to hasten matters, therefore, the quarters for the medical officer were completed, and, towards the end of the year, the medical officer appointed to be in charge went into residence because it was thought that his presence would hasten the establishment, help to develop the plantations, give general and personal supervision to the buildings, sites, water supplies, and other kindred matters so urgently important for a large undertaking. It is proposed in this settlement to have a series of villages in which the various races will live together with much freedom, and where each man who can do so will look after his own plantation, and partly, at any rate, contribute to his own maintenance by so doing.

Ankylostomiasis.

This disease still brings large numbers of patients to hospital, and recent investigations prove that it is also fairly prevalent among Fijians. It does not however show nearly such grave manifestations in them as it does in the imported Indian labourers, many of whom are permanently invalided because of it, and many of whom bring it with them to the Colony. If treated early, results are very good.

Plague was again in evidence in Sydney, but only for a very short period, and all the usual precautions with regard to shipping were again taken. Most of the steamers which arrive in Fiji are unprovided with proper disinfection apparatus. Some of these have a Clayton disinfector, using compressed sulphur dioxiod, but in the case of those who have not this machine installed the fumigation of the ship and cargo is carried on by means of sulphur fumes from open pots placed in the holds. This method, unless carried out with extreme care, is apt to be of very small value.

Vaccination.

Vaccination was carried out as usual.

Public Lunatic Asylum.

The number of patients shows an increase. The increase is in the number of native Fijians and Indians, and mainly in the latter race.

A new ward was begun towards the end of the year in a far better adjacent site for the male native patients; this will be occupied next year; it is also hoped that the male European patients will be moved to a site away from the present very depressing situation. Request has also been made for the building of a separate ward for female Europeans. At present they are in the same building and compound as the native women, and this is objectionable from all points of view. The female patients are looked after by two resident native female attendants (Samoans), with daily visits of supervision from the matron and staff nurse of the Colonial Hospital. It is not considered that this is sufficient, and it is thought that it will be far better if a European resident attendant is provided for the female patients.

There is no change to be recorded in the class of patients.

Government Pharmacy.

The work of this part of the department continues to increase largely. It may be divided into three heads:—

(1) The issue of drugs to the Colonial Hospital and all the government hospitals in the provinces; the issue of drugs to the district medical officers for distribution to native and other patients in their districts.

(2) The manufacture of drugs from crude material.

(3) Analytical work; the Government Pharmacist is also the Government Analyst.

The staff consists of the Government Pharmacist, one native assistant, and one packer. This staff is insufficient, when it is remembered that there are nine outside hospitals, the Colonial Hospital, twenty-seven native medical practitioners, and six other medical officers to whom monthly supplies have to be sent.

Colonial Hospital.

During the year the admissions at the Colonial Hospital increased from 1,516 to 1,744, the daily average having risen from 73·5 to 91·1.

An addition was made to the private wards of the hospital, so that there are now four of these instead of two as formerly, and they are not often vacant, and it is becoming more evident than ever that an entirely new building is needed, a concrete structure, preferably in two stories, with more modern arrangements, operation-room, &c.

The "Hospital" at present consists of—

(1) A European block in which are the wards of Europeans, operating-room, office and dispensary; there is no out-patient room, which is very much needed.

(2) A rambling block of nurses' quarters, far too cramped and confined, two junior nurses in many cases occupying the same sleeping-room.

(3) A "private" block of four private wards for Europeans, detached from the other European ward.

(4) A detached cottage for night nurses.

(5) A ward for native and Indian females.

(6) A ward for native obstetric cases.

(7) A ward for male Fijians.

(8) A ward for Indians and Polynesians.

(9) A ward for yaws and dysentery.

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(continued).

There are also detached buildings for kitchens, laundry, and servants' quarters; detached building for store, dispenser's quarters and stewards' quarters, and a building for native students.

These buildings are all separate, and the amount of work in going to and fro by the staff is large, because the distances between the buildings are considerable.

The medical officer has his quarters some 300 yards away, and connected to the main hospital by telephone.

In addition to inconvenience, the buildings are all (and more especially the European buildings) becoming too small for the needs of the town and Colony, and it is becoming every year a matter of increasing difficulty to find room even for the smallest additions, by reason of the way in which the former ones have been made, and also by reason of the formation of the land on which the buildings are; it is a rather narrow, irregular spit of a hill, but this could be much enlarged and improved by levelling and two-storied buildings.

Nursing Staff, Colonial Hospital.

The nursing staff has been increased by the addition of two pupil nurses, but these are only pupils and the staff is therefore still insufficient as far as senior nurses are concerned; for, instead of a matron, two staff nurses and a graduate nurse, there are only a matron and one staff nurse, and the rest are probationers. These deficiencies, however, will be remedied in time. There is, as has been noted before, the greatest difficulty in obtaining suitable probationers to fill vacancies, in spite of the fact that there are large numbers of young women in the Colony who it would be thought would find a useful outlet for their energies in this work.

With the two additional probationers, the nursing staff numbers ten, and that is none too large for the needs of the hospital, and to allow for the very necessary periods of leave.

The training of native midwives for the outside districts continues. Unfortunately the difficulty of this training is the lack of cases on which to give practical instruction, and there is therefore some delay in getting each batch finished; nevertheless, they are turned out with fair regularity once every six months in batches of six, and the demand for their services increases, so that it may be hoped that they are doing good work. There is no lack of candidates for the vacancies, and in all places to which they have been sent the reports of their work and conduct have been excellent.

In a new movement of this sort, it is not possible to say, after so short a period, what the result will be, but it seems safe to forecast that in time, when the department is able to send out these trained women to all parts of the group, they will displace all the old-time native midwives with their superstitions and dirty and unsanitary habits. Moreover, what is looked forward to as a result of sending out these women is that their training at the Colonial Hospital may enable them to teach mothers and children some of those very elementary rules of hygiene, by the observance of which there is no doubt that much Fijian infant life will be saved.

In the early part of the year the usual examination of native medical students was held, and two passed. These were sent out to the districts. There are now in the districts twenty-nine native medical practitioners, of whom nine are attached to provincial hospitals as "house surgeons." The rest are stationed in the districts away from hospitals, and move about from place to place. The work that is being done by these men is in many instances very good, though there are some who are rather too old and do no more than they are actually obliged. It is worth noting that there is never any shortage of candidates for vacancies.

New quarters of a more hygienic and permanent type are to be built for them; their pay has been put on a gradual incremental scale, and they are now all on the pensions list of the Colony, so that it may be said that their prospects are far better than they were, and that they are on a more assured base as regards their position, now that they have better recognition.

Levuka Hospital.

A new hospital is to be built in Levuka, partly for Europeans and partly for natives. There has been a very urgent demand for this from the people of Levuka for several years. It will be under the medical officer who is resident in Levuka. He will have a native medical practitioner resident as dispenser, dresser, and chloroformist, a European nurse in charge, and a native assistant nurse.

The town is badly in need of some system of drainage for surface waters, and possibly this point will be considered in connection with a sewerage scheme. There are several areas of the town in which storm-waters are apt to collect and stagnate, because these areas are low-lying and require to be reclaimed or raised before any system of drainage can be effectual.

A sanitary inspector, who shall devote the whole of his time to the work of inspection of the town of Suva, is to be appointed. His duty will be to work under the Medical Officer of Health, and make frequent periodical inspections of the entire town, and keep the Medical Officer of Health informed of all breaches of the Public Health Act.

New Gaol.

A new gaol is to be begun. It is to be a work of some magnitude, and there is to be a gaol infirmary within the precincts, a far better arrangement than the present one, by which all prisoners are admitted to the Colonial Hospital.

During the year a committee was appointed to report on the Public Health Act and to suggest points for revision, for it was recognized that a more modern Act is urgently needed to meet the public

health requirements of the Colony. After the submission of the report, it is expected that a new Act will be drafted.

The work of the medical officers in the districts has progressed as usual. One district (Vuda) is found to be too large for one medical officer, who has, besides port work at his headquarters, a large hospital at the far end of his district. It has therefore been decided to divide the district, and establish a medical officer at the Nadi end of it.

A new district medical officer has been asked for on the island of Vanua Balavu at Savusavu, which is a fairly large centre of population, both native and European, and in which there are many plantations, indentured and other labour.

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MEDICAL REPORT FOR THE YEAR 1910.

By J. BAIRD ALBURY, M.R.C.S., L.R.C.P.,

Acting Medical Inspector.

THE general health of the Colony during the past year has been on the whole good.

During the autumn and winter months influenza has existed in an epidemic form in New Providence and on some of the outer islands; its propagation has probably been greatly facilitated by means of the dust consequent on the prolonged drought; while many of the cases have been of a severe nature, comparatively few deaths have occurred.

A few cases of typhoid have occurred in the island during the year, and there were two deaths from the same.

During the early part of the year a case of small-pox was landed in the Colony from Mexico, but prompt measures of isolation and disinfection prevented the occurrence of secondary cases.

A few cases of typhus fever were introduced into Ragged Island, but the disease did not spread.

The street drainage of the city is still in an unsatisfactory condition, but such measures as the finances of the Colony justified have been carried out for its improvement.

The rainfall during the year (25·71 in.) was unusually low, but the supply of spring water has been plentiful and good.

The annual return of births and deaths for the Colony are shown in the table of the report.

A census of the population is now in course of preparation.

Six hundred and twenty-two vaccinations were successfully performed in New Providence during the year, and 1,637 on the out-island settlements.

Experiments with various vaccine lymphs have been carried out, but that from Dr. Renner's establishment has proved to be the best as heretofore.

RETURN OF THE STATISTICS OF POPULATION FOR THE YEAR 1910.

Number of inhabitants by the Census of April 14, 1901	53,735
Number of births since the last Census (including 2,129 in 1910)	21,012
Number of deaths since the last Census (including 1,457 in 1910)	12,798
Number of immigrants	Not known
Number of emigrants	Not known
Number of inhabitants on December, 31, 1910 (not accounting for immigration or emigration)	61,949
Increase	8,214

METEOROLOGICAL RETURN FOR THE YEAR 1910.

	Temperature.				Rainfall.		Winds.	
	Shade maximum	Shade minimum	Range	Mean	Amount in inches	Degree of humidity	General direction	Average force
January	81·5	73·3	8·2	69·7	0·40	83·5	S.E.	11·2
February	74·5	65·7	8·8	70·8	0·30	81·4	S.E.	12·1
March	75·9	66·00	9·9	72·4	0·36	73·8	N.E.	8·4
April	78·8	68·7	10·1	75·6	1·16	74·1	E.	8·0
May	81·8	70·9	10·9	78·3	1·14	75·8	S.E.	9·2
June	85·2	74·9	10·3	81·9	5·55	77·1	S.E.	6·5
July	86·9	75·5	11·4	83·6	3·37	73·5	S.E.	8·4
August	87·3	76·5	10·8	84·1	2·90	73·9	S.E.	9·2
September	83·4	75·3	8·1	82·8	4·25	74·4	E.	5·3
October	84·1	74·4	9·7	80·5	4·95	75·6	E.	7·1
November	78·7	68·5	10·2	74·9	0·90	70·6	N.W.	6·7
December	72·6	65·6	7·0	69·5	0·43	69·8	N.E.	10·9
Year	80·9	71·3	9 6	77	25·71	75·3	—	8·6

Return of Diseases and Deaths in 1910 at

New Providence, and the Alexandra Hospital, Bahamas.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	6	—	6
Anæmia	1	—	1
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	21	11	22
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	10	3	10
Enteric Fever	5	4	5
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	20	—	22
Gout	1	—	1
Hydrophobia	—	—	—
Influenza	8	1	8
Kala Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	1	—	3
(*b*) Anæsthetic	3	—	7
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	5	—	5
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	13	—	14
Malignant	10	4	11
Old Age	—	—	—
Other Diseases	1	—	1
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	5	—	5
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	1	—	1
Septicæmia	3	2	3
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	1	—	1
Syphilis	—	—	—
(*a*) Primary	1	—	1
(*b*) Secondary	30	—	31
(*c*) Tertiary	38	13	38
(*d*) Congenital	6	—	7
Tetanus	—	—	—
Trypanosoma Fever	—	—	—
Tubercle—	73	33	83
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	38	1	43
Circulatory System	29	11	30
(*a*) Valvular Disease of Heart	—	—	—
(*b*) Other Diseases	—	—	—
Digestive System—	39	9	39
(*a*) Diarrhœa	—	—	—
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	4	—	4
Eye	17	—	17
Generative System—	—	—	—
Male Organs	33	—	34
Female Organs	14	1	15
Lymphatic System	—	—	—
Mental Diseases	24	3	56
Nervous System	22	7	27
Nose	—	—	—
Organs of Locomotion	2	—	2
Respiratory System	6	4	8
Skin—	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	10	1	13
(*f*) Other Diseases	—	—	—
Urinary System	5	3	8
Injuries, General, Local—	32	2	34
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	5	—	5
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	95	—	97
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

Colonial Medical Reports.—No. 19.—Seychelles.

MEDICAL REPORT FOR THE YEAR 1910.

By J. B. ADDISON,

Chief Medical Officer.

Vital Statistics.

The population of the Colony at the end of 1909 was 22,409, and has been estimated this year to be 22,620, an increase of 211.

The total number of births registered during the year was 709, giving 31·35 per 1,000 of the estimated population. The total number of deaths was 368, giving a mortality of 16·25 per 1,000. The death-rate last year was 15·48 per 1,000.

The number of deaths recorded of children under 5 years was 149; in the preceding year the number was 110.

There were 54 stillbirths and 14 twin births. The stillbirths were higher than the preceding year, when there were 46. There was one case of triple birth.

Meteorological Observations.

The mean temperature for the year was 79·5° F., nearly the same as last year, when it was 79·3° F. As usual, April was the hottest and August the coolest month of the year. January and December were the wettest months of the year. The total amount of rain that fell during the year was 83·31 in., more than the preceding year, when 79·95 in. were registered. October this year proved to be a very dry month; only 0·03 in. of rain were recorded. The monsoon blew with an average force during the year; S.E. winds began in May and continued until October.

Diseases Prevalent during the Year.

There was nothing of note in the diseases prevalent during the year. There was no epidemic disease beyond a small outbreak of influenza of a benignant type.

A small outbreak of beriberi occurred at Coetivy Island; there were 29 cases with 14 deaths. This disease had not been noticed before at Coetivy. The Assistant Medical Officer visited the island, and his inquiries showed that the scale of rations to the labourers had been considerably diminished some three months before the outbreak. The owner of the island was advised to augment the rations again and to substitute Bengal for Saigon rice, which had previously been given. He carried out these measures, and no further cases occurred. It is of interest that, whereas the disease, as it has been seen in the other islands, was almost exclusively of the œdematous type, at Coetivy all the cases which were seen were of the emaciated type. There were a few cases at St. Pierre, but not so many, or of so severe a nature.

There were several cases of pulmonary tuberculosis during the year, but not more than had been noted in previous years. The amount of the disease does not seem to be increasing.

There seemed to be an increase in the amount of syphilis during the year. A large number of babies suffering from the congenital form of the disease were treated at the Government dispensary in Victoria.

The town of Victoria is being gradually improved from year to year. In the central part of the town many of the old dirty wooden houses have been replaced by stone buildings, and the general type of building all over the town is more airy and sanitary than formerly. Better arrangements have been made for watering the streets.

Meteorological.

Months	Barometer	Solar maximum	Minimum on grass	Shade maximum	Shade minimum	Range	Mean	Amount in inches	Depth of humidity	Direction of wind	Average force	Deaths per month
January	30·01	133·0	73·1	82·3	76·5	5·8	79·9	13·02	74·5	N.W.	7·1	27
February ...	30·02	144·3	74·4	83·2	77·8	5·4	80·5	6·45	74·9	N.W.	7·2	47
March	30·03	143·7	74·3	84·4	77·5	6·9	80·9	10·59	76·4	N.W.	4·4	30
April	30·03	152·1	74·6	85·2	77·9	7·3	83·0	10·83	75·6	E.	4·9	39
May	30·06	144·6	73·6	83·8	78·1	5·7	80·9	7·61	75·7	S.E.	9·6	28
June	30·06	137·8	73·0	80·9	76·2	4·7	78·5	1·28	73·1	S.E.	11·9	28
July	30 07	131·7	72·5	80·1	76·1	4·0	78·1	1·66	71 5	S.E.	12·7	26
August	30·05	139·3	73·2	80·1	75·5	4·6	77·6	1·51	73·3	S.E.	12·4	37
September ...	30·08	140·5	73·6	80·4	75·5	4 9	77·9	2·66	71·9	S.E.	11·3	33
October	30·10	145·3	73·1	81·4	75·3	6·1	78·3	0·03	72·9	S.E.	8·1	27
November ...	30·07	136·5	73·1	83·3	76·2	7·1	79·7	9·00	73·8	S.	4·9	26
December ...	30·06	112·0	73·1	81·9	75·5	6·4	78·7	18·67	74·7	N.W.	5·0	20

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(continued).

Vaccination.—The lymph has given very good results. In the central and South Mahé districts no failures are reported.

	Central District	South Mahé
First time	439	152
Second time	9	—
Third time	—	—
Unsuccessful	—	—
Total	448	152

This is the first year in which I have been able to report no failures.

Quarantine.—The quarantine station was used on several occasions during the year. The Recks' steam disinfector on Hodoul Island was used on many occasions to sterilize passengers' effects, gunny bags, &c., imported from infected ports.

Hospitals and Dispensaries.—There were 480 in-patients at the Victoria Hospital during the year, and 3,198 persons were treated as out-patients at the four dispensaries.

Arrangements were made during the year to institute a maternity home in Victoria. Structural alterations were, of course, necessary to the building chosen for the purpose, and it is hoped that a fully equipped home for confinement cases will be ready shortly. One of the main objects of the institution will be the training of midwives. It will be of the very greatest benefit to the Colony to have properly trained midwives instead of the ignorant women who up till the present have fulfilled these functions.

	Males	Females	Total
Estimated population ...	11,522	11,098	22,620
Net increase during 1910 ...	48	163	211

Birth-rate during 1910, 31·35 per 1,000. Death-rate during 1910, 16·28 per 1,000.

Medical Report of the Assistant Medical Officer, South Mahé, for 1910.

There is indeed little to report with regard to the medical aspect of the district during 1910, with the exception of chicken-pox, which is more or less endemic, and which breaks out at irregular periods. There was nothing exceptional in the disease of South Mahé. A death-rate of 9·81 per 1,000 is very low indeed for a tropical country, and it bears comparison even with a healthy English county. At the end of the year influenza was prevalent and caused two deaths. The disease was not dangerous, or even of a serious nature.

There was no death from tuberculosis during the year. This does not mean that the disease is stamped out, but it points evidently that it is not making headway.

In 1909 I had six deaths from this disease in the district, and it is certainly a pleasure to see that it has not claimed any victims in 1910.

Syphilis.—There is no doubt that this scourge will give trouble in the future; the male members of the community have got the virus fairly well spread amongst them. It has spread rapidly within the last two years, and in my private cases I see sufficient evidence that it is spreading fairly quickly in my district.

The new drug called Salvarsan, or "606," has justified itself, being a remedy that cuts short this disease, but as it is expensive, and thereby out of the reach of the poorer inhabitants, I think the Government would be justified in giving a supply to the district to be used free of cost for the poorer patients. The gain in health and the cutting short of the disease would more than compensate the additional expense incurred by free distribution.

Ankylostomiasis.—There is not the least doubt that this disease is spread over the district. In my last report I drew attention to the subject, and to steps that should be taken to prevent contamination. When the matter is put before the people it may help to keep it in check and prevent other members of the family being infected.

Vital Statistics.

This year a census of the Colony will be taken, and next year there will be reliable data on which to go for statistical purposes.

With an estimated population of 4,890, the death-rate for the year was 9·81 per 1,000 of the population. This is lower than last year, when the death-rate was 11·25. A reference to previous returns shows that the death-rate has fallen steadily since 1906. There were 11 deaths of children under one year, compared with 13 in 1909, but if the total for children under five years be taken, there were 24 deaths for 1910 against 20 in 1909.

The principal diseases causing death are as follows: Anæmia, 2; aneurism, 2; asthma, 3; endocarditis, 2; gastritis, 5; influenza, 2; infantile marasmus, 7; leprosy, 2; pneumonia, 3; senile decay, 6; syphilis, 4.

The births were only 138 for the year, compared with 160 in 1909, and 167 in 1906. With the population as estimated, this works out a birth-rate of 28·22, the lowest on record. As remarked in my report last year, there is a steady diminution setting in in the birth-rate. I believe it is due to the fact that the island is getting over-populated, and means are taken to keep the families in check.

There were 25 marriages for the year, which is above the average. Marriages may be looked upon as a true index of the prosperity of the people. When money is rare and work scarce they fall away, while in the prosperous years they increase.

Dispensaries.

Medical assistance was rendered to the poor at the dispensaries of Anse Boileau and Anse Royale during the year. As a rule the Anse Boileau Dispensary has few patients. The following is a list of patients treated at the Anse Royale Dispensary during the year:—

Month	Old		New		Total
	Males	Females	Males	Females	
January ...	16	18	5	9	48
February ...	11	18	6	8	43
March ...	12	16	7	4	39
April	12	21	6	3	42
May	11	20	7	4	42
June	12	19	5	7	43
July	9	21	7	3	40
August ...	16	25	2	2	45
September ...	11	22	4	3	40
October ...	12	21	4	3	40
November ...	11	22	4	9	46
December ...	9	15	2	6	32

The vaccination returns for the year are very satisfactory; the lymph supplied was excellent. There were no failures. The number of children vaccinated was 152.

Surgeon's Work in Police Cases.

There was one important case during the year, in which a woman was charged with killing her newborn infant. The medical evidence was not sufficient to send the case forward for trial. There were the usual number of slight cases of assault, chiefly of a trivial nature, brought up by the police.

There was no accidental death during the year. There was one case which died under suspicious circumstances: a *post-mortem* showed that the cause of death was aneurism.

Diseases causing death in South Mahé: Anæmia, 2; aneurism, 2; asthma, 3; dementia exhaustion, 1; dysentery, 1; endocarditis, 2; epilepsy, 1; gastritis, 5; hæmoptysis, 1; influenza, 2; infantile marasmus, 7; leprosy, 2; paralysis, 1; pneumonia, 3; senile decay, 6; sarcoma, 1; syphilis, 4; tetanus, 1; uterine cancer, 1; uterine fibroid, 1; unclassified cause given as fever, 1. Total, 48.

Seychelles Lunatic Asylum.

Report of the Medical Superintendent for 1910.

The asylum was first opened on March 13, 1906, and from that date up to December 31, 1910, there have been 38 patients admitted, being 27 males and 11 females. This total includes 3 males transferred to the asylum from Mauritius. During this period there were discharged as recovered: 8 males and 1 female; as relieved 1 male; and there died 5 males and 1 female, leaving 22 patients in the asylum books on December 31, 1910.

When the asylum was commenced we had only temporary premises, and the surroundings left much to be desired. Now the asylum is a modern building, well ventilated, the dormitories large and airy, surrounded by a well-kept garden. There are modern conveniences; even a telephone, the first in Seychelles, has been added.

With regard to the public purse, the asylum as an institution has more than justified its existence. Formerly the patients were sent to Mauritius, being thus cut off from their family and relatives; the cost of forwarding patients with the necessary guardians was a serious item of outlay. The saving under this head is therefore considerable.

Another and important saving is effected under the head of paying patients, the amount contributed for the year being Rs. 867.08.

I am not laying so much stress on the sentimental side of the question. Formerly the patients were cut off from their families, now there are regular visiting days, and the horror of asylum treatment is robbed of much of the terror with which it was associated under the former system; but it is also an important side of the question, as sentiment and feeling are closely bound together in the treatment of those sick and mentally affected.

The health of the inmates was good during the year. There was one death in the male side; the patient, who was old and worn out, was in the asylum for three years. There were no cases of contagious or infectious disease during the year.

There were admitted during the year to the asylum three males and three females. They were all pauper patients, with the exception of one female, who was a second-class paying patient.

Two males and one female were discharged during the year as cured, and in addition one female was allowed "out on trial." "Out on trial" is always the preliminary stage to that of being discharged as cured.

One male patient died during the year. He was admitted on June 12, 1907, and went into dementia, and finally died from exhaustion.

As in past years the patients get a fair amount of recreation. In the wards draughts and dominoes are provided, and for patients that can read magazines and books. Illustrated journals are at times forwarded to the asylum by charitably disposed persons, and they are always welcome; even the dullest of the inmates can always find pleasure in their contents.

On the male side there is a vegetable garden, which is worked by the inmates. The produce goes to the kitchen, and helps materially to reduce the cost of maintenance. In addition, the male patients keep the grounds of the asylum in order, and some of them have turned out expert gardeners. The female side makes all the asylum clothing required for the inmates, and the repairs of linen and clothing are also undertaken by the female side. There is, therefore, a fair amount of money saved in both departments by the labour of the inmates.

The question of good and careful nursing is very important. It is necessary to get a fairly intelligent type of people to act as attendants, a class that is better educated and more intelligent than that of the labouring classes. In the male side the difficulty is not so marked as in the female, and it is difficult to attract to the service as attendants the class which one would wish.

It is proposed to draw up a course of study and deliver a course of lectures to the attendants in mental nursing. The syllabus of the course will follow that of the Psychological Association as laid down for English asylums.

Return of Diseases and Deaths in 1910 at the

Victoria Hospital, Seychelles.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	—	—	—
Anæmia	9	1	9
Anthrax	—	—	—
Beriberi	15	3	16
Bilharziosis	—	—	—
Blackwater Fever	2	1	2
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	1	—	1
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	10	—	10
Enteric Fever	—	—	—
Erysipelas	—	—	—
Fébricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	—	—	—
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	9	—	9
Kala Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	3	—	3
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	—	—	—
Malignant	—	—	—
Old Age	14	5	15
Other Diseases	—	—	—
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	174	1	174
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	4	2	4
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	8	—	8
(*a*) Primary	—	—	—
(*b*) Secondary	—	—	—
(*c*) Tertiary	—	—	—
(*d*) Congenital	—	—	—
Tetanus	2	1	2
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	59	—	60
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	2	—	3
(*b*) Other Diseases	7	—	8
Digestive System—	—	—	—
(*a*) Diarrhœa	1	—	1
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	4	—	4
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	6	—	6
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	39	3	41
Ear	1	—	1
Eye	7	—	7
Generative System—	—	—	—
Male Organs	21	—	21
Female Organs	37	2	38
Lymphatic System	3	—	3
Mental Diseases	—	—	—
Nervous System	21	1	23
Nose	—	—	—
Organs of Locomotion	16	—	20
Respiratory System	39	7	44
Skin—	3	—	3
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
Urinary System	30	1	30
Injuries, General, Local—	52	2	52
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	4	—	4
Ascaris lumbricoides	1	—	1
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	2	—	3
Filaria medinensis (Guinea worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

Colonial Medical Reports.—No. 20.—Siam.

STUDIES ON BERIBERI AND ITS PREVENTION IN SIAM.

BEING A REPORT UPON CERTAIN INVESTIGATIONS ON BERIBERI CARRIED OUT IN SIAM BY THE MEDICAL OFFICERS OF THE HEALTH DEPARTMENT OF THE MINISTRY OF LOCAL GOVERNMENT.

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INTRODUCTORY REMARKS.

As I have been asked by His Excellency the Minister of Local Government to submit a report upon the investigations made by the Health Department on beriberi in Siam, I shall try to confine my remarks as closely as possible to those investigations only and in as brief a manner as possible. Although beriberi had been an active cause of sickness and death for some years previous to 1909, our first attempts at prophylaxis on the basis of the rice theory were made in February of that year in the Asylum for the Insane. Parboiled rice, prepared according to the methods of Braddon, was then supplied to the inmates, with the result that beriberi at once stopped. Having at the same time to deal with a very severe outbreak of the disease at the Police School, the same form of rice was proposed for the police. They refused to eat it, however, stating that it had a sour and mouldy flavour. As an alternative, ordinary native hand-milled rice was adopted in place of white polished rice, as it was known that this form of rice had been in use in the Central Prison for years and with excellent results. Besides, the men had come from the country where they were accustomed to this kind of rice. Our results were just as good as with parboiled rice so far as prevention went, and upon July 1, 1909, the issue of parboiled rice was stopped in the Asylum for the Insane and hand-milled rice was substituted. Let it be noted that the padi was milled at the Police School and at the Asylum, and that careful watch was kept that it was not over-milled, in fact that the rice produced was what the Siamese call "red rice." It was not until February, 1910, that a scientific explanation of the reason for our good results was obtained, when we received from Doctors Fraser and Stanton a copy of their paper entitled "The Etiology of Beriberi." In their publication they showed, from careful and long-continued experiments upon fowls and by chemical analysis of the rices used, just what we had already proven from ordinary practical experience with human beings, that the essence of the matter was the over-milling, or "polishing," as they called it. Their statement that "the estimation in terms of phosphorus pentoxide of the total phosphorus present in a given rice may be used as an indicator of the beriberi-producing power of such rice when forming the staple of a diet in man" was full of important possibilities if, upon investigation, it could be proven. I was upon the eve of my departure for Manila, where at the First Biennial Congress of the "Far Eastern Association of Tropical Medicine," on March 11, 1910, I had the honour of reading a paper on "Beriberi in Siam," which described our first experience of beriberi prophylaxis, and which concluded with the following words: "I believe that I have satisfactorily demonstrated the fact that Siam rice can be shorn of its danger as a staple article of food through the simple process of under-milling."

On returning to Bangkok, we proceeded to test Fraser and Stanton's statement with regard to the value of the phosphorus pentoxide as an indicator. At the same time we determined to try if a suitable under-milled rice could be prepared in a steam rice mill on a commercial basis. This step was all the more urgently pressed upon us by the fact that the rice millers were up in arms against the white polished rice theory, fearing that legislation against the importation of white rice into many of the neighbouring countries was imminent, and that thereby they would suffer great financial loss. Those of the rice millers who took time to consider the matter soon saw that there was no cause for apprehension and, in fact, stated that they were prepared to supply rice milled to any degree, provided the demand was sufficient. With the assistance of one of these rice millers various trials were made, until we had obtained a rice which could be safely consumed without causing beriberi and which could be milled easily, cheaply, and in any quantity desired. This rice was first served out to the inmates of the Asylum on October 6, 1910, and it may be interesting to note that its phosphorus content was 0·42 per cent. P_2O_5. Fraser and Stanton, as well as Aron in Manila, have given 0·4 per cent. as the minimum for the phosphorus pentoxide, as proven by experiments upon fowls, a figure which is practically the same as we came to after experiments to be detailed later on. Further work is required, however, to determine how this standard may be uniformly estimated. Anyhow, the above remarks show the main lines along which we have moved in these investigations, the details of which will now be related. As the publication of our results is somewhat belated, they may tell little that is new, but at least we hope that they will confirm some of the valuable results which have been already published by other and better-known workers who have attempted to elucidate the problem of beriberi.

Colonial Medical Reports.—No. 20.—Siam.— *(continued).*

EXPERIMENTS WITH VARIOUS FORMS OF RICE.

(1) *Experiments with Parboiled Rice.*

(*a*) *At the Asylum for the Insane.*—As I have already mentioned in my introductory remarks, parboiled rice was first supplied in February, 1909, to the inmates of the Asylum for the Insane. For various reasons this institution was chosen as the site for original experiment. It was not only a notorious hotbed of beriberi, but we could control the dietary in every way, and we could easily observe the results of the new rice from day to day.

Dr. D. K. McDowell, then Principal Civil Medical Officer, Straits Settlements, was kind enough to furnish me with a full description of the method of preparing parboiled rice. The necessary apparatus was purchased and a gang of the able-bodied patients was told off to work a rice mill. By February 12 a sufficient quantity of the new rice had been prepared and was on that day first issued to the patients.

As I have just stated, the Asylum was a hotbed of beriberi. Since 1901 nearly half the patients had suffered from the disease, and in more than 90 per cent. of these so suffering the result was death. Since the control of the Asylum was transferred to the Health Department in April, 1906 the following are the figures for beriberi:—

Year	Cases	Deaths	Average daily number of inmates
R. S. 125 (1906-1907) ...	116 ...	113 ...	86
R. S. 126 (1907-1908) ...	119 ...	104 ...	94·5
R. S. 127 (1908-1909) ...	122 ...	122 ...	116·5
R. S. 128 (1909-1910) ...	0 ...	3* ...	193·8
R. S. 129 (1910-1911) ...	7 ...	3 ...	310
R. S. 130 (1911-1912) ...	14 ...	0 ...	250

* Cases carried over from previous year.

These figures definitely show the pernicious nature of the disease as we found it in the Asylum. On February 12, 1909, when parboiled rice was first supplied, there were twenty-two insane patients suffering from beriberi. Of these only four died and *no new case of beriberi developed from date so long as parboiled rice was in use.* As I remarked in a former report, this rice seems not only to be highly valuable as a prophylactic, but is also of great value as a curative agent.

It should be noted that no other change whatever was made in the dietetic or hygienic conditions under which the patients lived in the Asylum. With the idea so long held that beriberi was an infectious disease, disinfection of rooms, scraping of walls, and even planing of floors had been rigorously carried out, but without effect, and finally beriberi patients had been allowed to mix freely with non-sufferers. That the disease was checked so rapidly under these circumstances is a point in favour of the modern view that it is not infectious either from person to person or from place to person.

Parboiled rice was continued at the Asylum from February 12, 1909, until June 30, 1909, during which period no new case arose.

(*b*) *Experiments with Parboiled Rice in the Hospital for Infectious Diseases.*—Since early in 1906 one of the pavilions in this Hospital had been used as a beriberi ward, where the patients were treated according to the ordinary methods then in vogue. White rice was, of course, given, but in lessened quantities; the difference in diet was made up with bread, beef, pork, peas, beans, &c. The death-rate on this treatment during the year 1907-8 was 20·8 per cent., during 1908-9 it was 17·1 per cent., while during 1909-10, when parboiled rice was supplied, the death-rate fell to 6 per cent.

On the curative effects of this form of rice I cannot do better than quote the following remarks from Dr. Carthew's last report to me on the work done at the Hospital for Infectious Diseases during the year R. S. 130 (1911-1912).

Dr. Carthew says: "I am convinced that the consumption of parboiled rice by a beriberi patient does make a difference in the duration and severity of his illness. It is interesting to contrast the mortality from beriberi during various years at the Isolation Hospital and the various kinds of rice consumed by the patients during these years."

Year	Total cases treated	Mortality-rate per centum	Kind of rice consumed
126 (1907-1908) ...	188 ...	20·8 ...	White polished.
127 (1908-1909) ...	268 ...	17·1 ...	White polished for 10½ months; parboiled for 1½ months
128 (1909-1910) ...	314 ...	6 ...	Parboiled rice for 12 months.
129 (1910-1911) ...	180 ...	12 ...	Hand-milled and Under-milled by steam mill.
130 (1911 1912) ...	115 ..	8·7 ...	Under-milled and hand-milled.

Similar good results have been obtained at the

(*c*) Police School, where constables who develop beriberi at the stations are sent for a course of this rice along with other treatment. It is an undoubted fact, however, that owing to its stale and musty flavour, this rice is not popular amongst Siamese. Attempts were made to get rid of the unpleasant flavour by very frequent changes in the water in which the padi was soaked prior to steaming, but without any great success. It may be, that were a constant stream of water run through the soaking padi, the taste of the rice would not be so objectionable, but in the absence of such a water supply we had no means of testing this. It is for these reasons that we have been forced to adopt other means of prevention.

(2) *Experiments with Under-milled Rice prepared by Hand.*

It has long been known that in rice-growing countries, where the staple article of diet is naturally rice, the native is peculiarly free from beriberi so long as the rice is milled by hand in the native fashion. This has been demonstrated time and again in China, Indo-China, Siam, Burmah, Java, Madagascar, &c. It is often stated that the principal factor in prevention is the *freshness* of the rice, for, as a rule, padi is milled for daily consumption only. It is not milled into rice and kept for weeks or months as is the white rice of the

steam mills. Later on something will be said about this factor of "freshness," but in the meantime it may be stated that hand-milled rice *so long as it is not over-milled* is an excellent prophylactic against beriberi, as the following observations will show:—

(*a*) *Hand-milled Rice at the Police School.*—When conscription for the police came into force, the first batch of conscripts was called up at the beginning of December, 1908. Numbering 500 men, they all came from the country districts where they had been accustomed to eat their own home-milled rice. On joining the police force, they were fed by contract on white polished rice.

A case of beriberi was detected on December 28, 1908, that is within a month of enrolment, and another was seen on December 30. The next case reported sick on January 6, 1909, and was followed by one each on January 7 and 8. Two cases were noted on the 10th, and no more until the 19th and 20th, when there were two on each of these days. Cases now reported sick every day, until on January 30 20 new cases of beriberi were detected. In all, 56 cases arose during January, although the disease did not start to take any definite hold until the 18th of that month. On February 1 there were 10 cases, on the 2nd 19 cases, on the 3rd 11 cases, on the 4th 16 cases, on the 5th 54 cases, and on the 6th 107 cases. As they developed, all these cases were given a month's leave to go home, as previous experience had shown that in this way they recovered more rapidly than if confined to hospital. The real reason for this, *i.e.*, the return to under-milled rice from white polished rice, had not then dawned upon us.

On Sunday morning, February 7, 1909, a general parade of the remaining conscripts was held. The total was 227, and of these, after medical examination, only 47 were passed as free from beriberi and fit for drafting to the various police stations. The remaining 180 suffered more or less from symptoms of the disease and were granted a month's leave to go home. Thus, in two months a total of 444 conscripts out of 500 had contracted beriberi.

Only the permanent staff remained at the school, and as they would not eat parboiled rice hand-milled rice was purchased and supplied to them. Before the men on sick leave had returned a hand mill had been erected at the school, padi had been purchased, and rice had been prepared and issued. Since this date till now, July 3, 1912, under-milled rice prepared by hand has been continuously consumed at the school, where as one batch of conscripts is passed out to the stations another batch comes in. The permanent staff numbers about 100, but the average number of conscripts undergoing instruction has varied from 300 to 800 men.

Since March, 1909, ten cases of beriberi have apparently arisen in the school. Two of these cases were members of the permanent staff, who were found to be getting white rice supplied to them from their own homes in Bangkok. Several cases were relapses, having previously suffered from beriberi, while the facts with regard to the remaining half-dozen were by no means certain. Allowing that the disease really developed at the school, this record of three years is nevertheless a remarkable one. Periodic inspection of the rice was made in order to insure that it was not milled too much.

Over-milling is not impossible even with hand-mills, and, in fact, we had a case of beriberi in a police sergeant who stated that he only ate hand-milled rice. On obtaining a sample of his rice, it was found to be a very fine specimen of hand-milled rice with most of the grains whole but very white in colour. It had been so over-milled that it contained no more than 0·14 P_2O_5, equal to some samples of polished steam-milled rice. Influenced by these results at the Police School, we determined to try

(*b*) *Hand-milled Rice at the Asylum for the Insane.*—This rice was commenced on July 1, 1909, and was continued until June 20, 1910, practically twelve months, without a single case. Here, again, great care was taken that the rice was well under-milled, or was, as it is generally called, "red rice."

(*c*) *At the Customs Barracks.*—Hand-milled rice was also recommended, and an offer to supply it from the Asylum was made. Advantage was taken of this offer but in a very half-hearted fashion, for the amount of rice regularly purchased from the Asylum could do little more than feed those affected with beriberi. This disease had been present for several years amongst the men, and the continual invaliding of many of the guards was a source of much inconvenience to the department and of considerable financial loss to the Government. During the year R. S. 127 (April, 1908, to March, 1909) a total of 69 new cases was reported, while during the following year 77 new cases arose. White polished rice continued to be supplied to the men during these two years as it had been for many previous years, and still beriberi persisted until the year R. S. 129 (April, 1910, to March, 1911), when in July all white rice was stopped, with the result to be recorded later. This is a good example of a case where half measures proved to be useless.

(*d*) *At the Reformatory and Police Station at Koh Si Chang.*—Beriberi had been present since white polished rice had been supplied, but since February, 1909, when hand-milled rice was substituted, no new cases have arisen—that is during a period of over three years.

(*e*) *In the Muang Jails.*—The case for hand-milled rice is very strong. There are six of these outlying jails, one in each of the Muangs or Sub-divisions of the Monthon or County of Bangkok.

In Minburi Jail, where hand-milled rice has always been supplied, the records of the last four years give only one case. Whether this prisoner was admitted already suffering from the disease or not, is not known.

No deaths took place from beriberi.

In Tanyaburi Jail, during the same four years, two cases are reported, of which one was said to have died of fever. One of these cases developed 23 days, the other 52 days after admission to the jail. Hand-milled rice alone is used.

In Pratoomtani Jail five cases without a death

were recorded during the year R. S. 127; during the following year there were no cases and no deaths; during the third year of our records one case arose and recovered, no deaths; while during the past year, R. S. 130, there were eleven cases and one death. Hand-milled rice had always been issued to the prisoners until September, 1911, when owing to the scarcity of local padi, white polished rice was purchased in Bangkok. Five cases developed in October, one in November, none in December, one in January, none in February, and four in March.

During three and a half years on hand-milled rice only six cases were reported.

Nontaburi Jail shows us the results of feeding on white polished rice. Until February, 1910, on this rice, beriberi had accounted for 59 cases of sickness and 27 deaths in rather less than three years. Hand-milled rice was commenced in February, 1910, that is close to the end of the year R. S. 129, and the result was shown by the record of one case and no death during the following year R. S. 130. This is all the more remarkable as Nontaburi Jail is on the bank of the river only some ten miles above Bangkok. White polished rice is largely sold in this district by Chinese hawkers from Bangkok and no doubt many of the prisoners had consumed it regularly before admission to the jail.

Paklat Jail shows the best record for the three years from R. S. 127 to 129 inclusive, there being no cases and no deaths. Hand-milled rice was always served out until September 1, 1911 (R. S. 130), when, owing to scarcity of local supplies of padi, white polished rice was obtained from Bangkok, and on October 23 three cases of beriberi were detected, the first cases in three and a half years. Two each developed in November and December, 1911, and in January, 1912. On January 1, 1912, hand-milled rice was again supplied, and no further cases have developed after the last two, which were detected on January 7.

Paknam Jail tells the same tale. During R. S. 127 white polished rice was used with seven cases and no deaths. Hand-milled rice was started at the beginning of R. S. 128, and on this rice the jail has been free from beriberi.

(*f*) *In the Central Jail and in the Prison*, where prisoners are kept waiting trial in Bangkok, hand-milled rice is prepared by the prisoners themselves. This is an old story to which I shall refer in speaking of the history of beriberi in Bangkok. Dr. Adamsen, the Physician to these institutions, has supplied me with the following data for the past five years. In the *Central Prison* during five years, R. S. 126 to R. S. 130, with an average daily number of prisoners amounting to 1,819, there were 63 cases of beriberi recorded. Of these 63 cases, 20 already suffering were admitted from Muang Nontaburi Jail, 38 from the Bangkok Jail, and only 5 arose in the prison.

In the Central Jail, during the five years R. S. 126 to R. S. 130, with a daily average of 1,500 prisoners, 98 cases of beriberi are on record. All of these men were admitted already suffering from the disease. No new case, arising in the jail, is on record.

(3) *Experiments with Under-milled Rice prepared in a Steam Mill.*

As I have already stated in the Introductory Remarks, the necessity of experimenting upon under-milled rice prepared in a steam mill was forced upon us by the evident alarm of the rice millers and the fear of legislation against Siam rice in foreign countries. As our experience of polished and unpolished rice tallied with that of Fraser and Stanton, we now proceeded to work on their basis of the estimation of the phosphorus pentoxide as a guide to the beriberi-producing properties of a rice. No limit had been laid down by them as yet of the minimum amount of P_2O_5 which such a rice should contain. Our only guide was to supply a rice similar in composition and appearance to our hand-milled rice upon which we already had such excellent results. With the cordial assistance of Mr. A. E. Stiven, Manager of the Borneo Company's rice mill, a start was made in the milling of an anti-beriberi rice prepared in a steam mill.

The padi chosen for trial was that which is milled into ordinary Straits No. 2 rice—a rice which had been blamed by Fraser and Stanton and others as a potent cause of beriberi in the Straits Settlements, Federated Malay States and elsewhere. Several samples of rice were milled until we obtained a sample so under-milled that it was apparently the same as our Asylum hand-milled rice.

Our first trial was made

(*a*) *In the Asylum for the Insane*, where from June 21, 1910, until August 12, 1910, Borneo Company's No. 1 sample was supplied to patients. After sixteen months' freedom from beriberi, two cases were detected, one on July 28 and one on July 29. It was evident that sample No. 1 would not do, so sample No. 2 was called for from the Borneo Company. This was less milled than No. 1, and was supplied from August 13 until September 4. As another patient developed beriberi on August 15, sample No. 3 was obtained from the Borneo Company. This sample, still less milled than the previous two, was supplied to the inmates from September 5 to October 7. During September no new case developed, but two arose during October, namely, on the 7th and 26th respectively.

On October 8 we commenced the use of No. 4, the least milled sample of all and which contained 0·42 per cent. of P_2O_5. Four more cases were discovered, one in November, two in December, and one in January, all in patients whose health had previously been in a poor state. As the rest of the inmates were in a good state of health No. 4 rice was continued until September 13, 1911, without any further cases of beriberi.

It should be specially noted that owing to the capacity of the Borneo Company's mill only large quantities could be milled at one time, and that therefore the rice consumed by the patients was *not fresh* but often *old under-milled rice*. The last milling took place on March 28 to 31, 1911, and it was this rice which was consumed up to the end

of August in the Asylum and well on into December in the Customs, as I shall relate later on.

Now, unfortunately, as the Borneo Mill had to be closed down owing to scarcity of padi, other rice had to be obtained, and for the under-milled steam-mill rice, the best No. 1 Quality Garden Export Rice was substituted from September 13. Still it was a white polished rice containing only 0·25 per cent. of P_2O_5. All seemed to be going well until November 26, seventy-four days after white polished rice had been started, when a case of beriberi was reported. Another case was detected the following day, and during December, from the 2nd to the 21st, twelve more inmates developed the disease. It was evident then that even the best quality of white garden rice, if highly polished, was not potent as a prophylactic. Until we could arrange for a supply of under-milled rice, I ordered the addition of "polishings" in the proportion of four parts white rice and one part "polishings." All the cases steadily recovered on "polishings" at first and later upon under-milled rice prepared by hand, which was obtained with some difficulty and started on January 9, 1912. "Polishings" were then stopped, for I am not much enamoured of this method of prevention. "Polishings" are difficult to digest, and with us gave rise to gastric disturbance, but in an emergency they are a valuable addition to the white rice diet. No more cases have occurred since December 21, 1911, till the date of writing, July 3, 1912. Apologies are due for digressing in this section from the subject actually under consideration, *i.e.*, trials of under-milled rice prepared in a steam mill, but I thought it a good opportunity to wind up the tale of beriberi in the Asylum for the Insane.

(*b*) *In the Customs Department*, as I have previously recorded, half measures were found to be useless, and from July 5, 1910, it was arranged that only under-milled rice from the Borneo Company, our No. 4 sample, would be permitted for the use of the guards who lived in the station.

During April, May and June of 1910 (R. S. 129) there had been 13 cases of beriberi, whereas from July 1, 1910, until the end of January, 1912 (R. S. 130)—19 months in all—only 10 cases were reported, and of these, 9 occurred during the first four months of the experiment. We thus have a total of 10 cases for 19 months, with a complete absence of beriberi for 11 consecutive months.

The last lot of No. 4 was finished in December, and, as I have already stated, the Borneo Company Mill had shut down; white polished rice of No. 2 Straits Quality was therefore purchased by the Customs Authorities and supplied to the men from December 16, 1911.

Although one case of beriberi had been reported in November (whether an initial case or a relapse is not stated) no cases occurred during December, 1911, or January, 1912, but in February, 1912, 3 cases developed; in March, 19; in April, 6; and in May, 9 cases. Here, again, we have the same monotonous tale of beriberi breaking out two months after the commencement of a white polished rice diet.

Miscellaneous Studies.

(1) *The History and Geographical Distribution of Beriberi in Siam.*

The first reliable report of this disease in Siam refers to a sharp outbreak which occurred in 1890 in the Central Jail in Bangkok. Exact details cannot now be obtained, but one of the medical men who saw the cases is still with us. He, Dr. T. Heyward Hays, tells me that a large number of the prisoners were affected, that the wet variety of the disease predominated, and that many cases had a fatal ending. It appears that white steam-milled rice had recently been substituted for the native hand-milled rice upon which the prisoners had formerly subsisted. Upon the outbreak of beriberi, the prisoners themselves complained that the new form of rice was the cause of the disease, and petitioned to be supplied with the old-fashioned "red rice." This was done, and beriberi disappeared from the jail.

The next epidemic occurred in 1896 during the construction of the Northern Railway at posts some sixty miles from Bangkok.

In 1897, during a visit of His Majesty the late King of Siam to Java, beriberi broke out amongst the men on board the Royal Flotilla.

Beyond these outbreaks, the disease was unknown in Bangkok until 1900.

Arriving in Bangkok in 1897, after nearly five years' practice in Singapore, where I had seen much of the disease, I was soon struck with the absence of beriberi amongst my patients in private or in hospital practice. On inquiry of several of my colleagues who had already been many years in Siam, I obtained the history of only one case—that of a Javanese gardener—but my informant was of opinion that the patient had brought the disease with him to Bangkok. Beyond the instances already reported the disease was unknown until the year 1900—the Siamese year R. S. 119. On August 29, 1900, our first case—that of a Siamese police constable—was admitted to the Police Hospital. Another case came in a month later, but after that no further cases are noted in the register of the Police Hospital until April, 1901; since then beriberi has gradually ~~become~~ one of the ordinary ~~diseases~~ seen at this hospital. ~~These figures~~ for the Police Hospital, taken from the actual daily register, do not quite tally with the account supplied "from memory" by my former colleague and predecessor, Dr. P. A. Nightingale, to Dr. Braddon, and published by him in his book entitled "The Cause and Prevention of Beriberi." As I quote from data filled in by Dr. Nightingale's own hand, it will be seen that his memory seems to have misled him when he says, at p. 207 of Braddon's book: "During December, 1900, a considerable number of police were sent into the Police Hospital suffering from the disease." Dr. Nightingale, however, saw a considerable number of cases in the Army and Navy, and was asked to report upon beriberi in the Army in January, 1901. During the year R. S. 120, that is, from April, 1901, till March, 1902, twenty-four police constables were admitted to the Police Hospital suffering from the disease.

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As for beriberi in the rest of the country outside Bangkok, details are scanty and uncertain. Dr. Nightingale, as reported by Braddon, states that: "About the end of November, 1900, I received reports that a mysterious disease was spreading along the sea border to Siam from Cambodia, causing numerous deaths. At first the Siamese authorities in Bangkok thought it was the bubonic plague, but on making inquiries I was convinced it was beriberi."

Further data are given for the Interior in a paper by Dr. Arthur F. G. Kerr on "Beriberi in Northern Siam," which was published in the *Transactions of the Society of Tropical Medicine and Hygiene*, December, 1911. According to Dr. Kerr: "In the years 1908 and 1909 Northern Siam was visited by a severe epidemic of beriberi, which was confined to the valley of the Meh Ping, an alluvial plain almost wholly under rice cultivation. Chiengmai, the capital of Northern Siam, is situated near the centre of this valley. This epidemic commenced in July, 1908, and reached its maximum in the November of that year. In 1909 the number of cases was considerably less than in 1908, and now (August, 1910) no new cases are reported. Previous to its appearance in July, 1908, the disease seems to have been almost unknown in this part of the country. A few native village doctors, on being questioned, said that they had seen a similar disease many years ago, but most of these men had no knowledge of any previous epidemic.

"One case of beriberi occurred in Chiengmai Jail in August, 1904. This case, a male, told me that in the district he came from other people had the same disease and several had died from it. The district from which this man came was one of those very lightly affected in the recent epidemic. No other case occurred among the prisoners till 1908, when there were two cases; in 1909 there was one case; and this year there have been, so far, no cases."

The Minister of Interior has very kindly supplied me with a return showing "the number of cases and deaths from beriberi in the provincial jails of the various Monthons in the Interior of Siam from R. S. 125 (1906-7) to R. S. 129 (1910-11)." These returns show that the disease has been recognized in one of the Monthons since the year R. S. 125, in another since the following year, in three others since the year R. S. 127, in three others since the year R. S. 128, and in one only since the year R. S. 129. In one Monthon four cases are reported to have occurred during these five years, but no dates are given. In three Monthons of the thirteen reported upon, no cases occurred. No data are given for the remaining two Monthons of the Interior.

It will thus be seen that beriberi has been known as a definitely recognized disease in Siam since 1890, when it first broke out in the jail in Bangkok. Except the outbreaks on the railway construction staff in 1896, and the epidemic amongst the naval men in 1897 when in Javanese waters, the disease seems to have remained in abeyance until 1900, when it was reported from Bangkok and from along the eastern coast of the Gulf of Siam. Since then it has settled in Bangkok and has gradually appeared throughout the country.

(2) *The Incubation Period of Beriberi in Bangkok.*

In the case of an infectious disease the determination of the incubation period presents no great difficulty, for, given a large number of cases in which the exact date of contact is known and the subsequent date upon which symptoms first manifested themselves, an approximate incubation period can be fixed. With regard to beriberi, however, the problem is more complex, and, in fact, so complex that the incubation period has been stated by various observers to be anything from a few days to several months.

As Braddon says, "In the case of beriberi it is never possible to say for certain when exposure to the possible cause began."

In cases where this period is stated to be only a few days, my opinion is that the observer has not examined all his cases beforehand in order to eliminate either latent or very slightly affected cases or cases which had previously suffered from the disease. Those who have had much experience of beriberi must have often detected symptoms of the disease in persons who have made no complaint and were fit for work, but were simply called up for examination along with the affected, say, in a prison or asylum. Again, we all know that a person who has suffered at all severely from this disease is liable to acute exacerbations for many months and even years afterwards. Unless we eliminate such cases we are liable to be misled, and may often underestimate the period of incubation. For the same reason, when experiments in prophylaxis are made, the results are unreliable unless we know that only healthy individuals have been under observation. This was the method carried out by Fraser and Stanton in their investigation, which was carried out in the state of Negri Sembilan and which was described in their preliminary report, entitled "An Inquiry Concerning the Etiology of Beriberi."

All the men—300 Javanese coolies—were examined and found to be free from any sign of existing or recent beriberi, and the result was that "no case of beriberi occurred in any coolie who had been on white rice for a less period than eighty-seven days." This seemed to me, on first reading the report in question, to be rather a long period, but from subsequent experience it would appear that the time taken to develop the disease may vary in accordance with the physical conditions and hygienic surroundings of the individual.

In attempting to decide this incubation period in Siam I have based my data either upon the length of time during which healthy men were under observation, or, as in the various institutions already referred to, upon the length of time taken for the disease to manifest itself on a change of diet to white polished rice and after a prolonged antecedent absence of beriberi.

Take, for example, the first batch of police conscripts—all healthy men—medically examined. The first case was detected on the 28th day after enrolment. The next case reported sick on the 30th day, and no more until the 36th. It was not until the 50th day that daily admissions became established. Between the 66th and the 70th day, 357 out of the total 444 cases (equal to 80 per cent.) were detected. If, as Braddon says, "the period at which the greatest number of cases become ill would represent the average period of incubation of the disease," then 66 to 70 days would be our figure for this outbreak.

In the Asylum for the Insane the first sample of under-milled rice from the Borneo Company was commenced on June 21, 1910. Beriberi had been absent for sixteen months, but it reappeared on July 28, thirty-seven days after the change of rice. Another case followed on the 38th day and another on the 55th day. Again, in the same institution, after a further absence of beriberi for a period of over ten months, that is, from January 14, 1911, until November 26, 1911, the disease broke out seventy-four days after the commencement of a white polished rice diet. Until "polishings" had been added to the rice thirteen other cases arose, the last on December 21, that is, 99 days after the change to white rice. In the first example the incubation period was 37 days for the first case, while in the second it took 74 days to develop, although the general conditions were equal in both periods.

In the Customs, after an absence of beriberi for eleven months (leaving out the single case in November), the disease broke out early in February, 1912. As white rice had been supplied from December 16, 1911, this gives an incubation period of at least a month and a half. Nineteen cases developed during March, but unfortunately the actual dates upon which these cases first reported sick were not noted by the officer in charge. Anyhow, for the majority of the Customs cases the period is about two months.

In Paklat Jail, where there had never been any beriberi during the last three and a half years on hand-milled rice, three cases were detected on October 23, 1911, that is, fifty-three days after white polished rice had been supplied for the first time. Two more cases were noted on November 2 after being on white rice 63 days.

It will be evident from consideration of these different dates that no definite incubation period can be stated for our cases. With regard to those police conscripts who developed symptoms as early as the 20th and 30th days, it may be that they were peculiarly susceptible, for it has often been noticed that newcomers are more liable to develop beriberi than old residents. However, as 80 per cent. of these men first showed symptoms between the 66th and 70th days, we may take this period as the average incubation period for healthy men doing open-air work on food of ordinary quality and quantity other than the rice, which to them was a change from their native hand-milled rice. For institutions like asylums and jails the incubation period has varied from 37 to 74 days—an average of 54 days, roughly speaking.

(3) *The Seasonal Incidence of Beriberi in Bangkok.*

In attempting to find out whether or not there was any definite seasonal variation in the incidence of this disease, I have been careful to collate not only as many cases as possible, but also to collate only such series of observations as were known to present a minimum of varying influences. The general conditions of the affected were also very similar if one excepts the Asylum for the Insane, where the cases arose amongst persons confined in an institution. As these latter cases amount to only 3·4 per cent. of the total 10,349 observed, the error, if any, must be negligible. In the series from the police, siriraj and naval hospitals, and from the Customs, the sufferers were all living under practically the same conditions. The highest figures are to be found during the months of September, October or November.

We have already shown that the incubation period of beriberi in Bangkok would appear to range on an average between 54 and 70 days. Take it roughly for argument at 60 days. This would mean, therefore, that the active agent has been at work during a period of two months prior to the time when symptoms of the disease have become subjectively so marked as to lead the patient to report himself sick. Is it not an unwarrantable deduction to make, that, because rain is falling heavily while the majority of cases report sick, the cause is the atmospheric moisture? On a similar basis of incubation period the May rise corresponds to high atmospheric temperature, while the March rise is preceded by lower temperatures during December, January and February than at any other period of the year. The main September rise is on a steadily falling mean temperature, while the fall in incidence during June and July is preceded by high temperature. From these data I think that it may be granted that rainfall, as well as atmospheric temperature, are not predisposing causes so far as Bangkok goes.

Do variations in food supply have any effect? What about rice?

During normal years the early crop of "Kau Bau" begins to be delivered in Bangkok during September and October, while the principal crop of "Kau Nak" arrives at the mills about December. From January until August it might be argued that the rice milled from the heavy crop is steadily getting older, and that here may be an explanation of the beriberi rise during August, September and October. The fall from October might possibly be due to the supply of fresh "Kau Bau." Why, however, should we have the rise of beriberi incidence in March, considering the fact that fresh rice from the principal crop has been on the market from January? It should be remembered, too, that all the fresh padi is not milled at once, but that milling goes on steadily for many months, the activity of the industry depending upon the amount of padi in hand and the demand in the markets of Siam and elsewhere for white rice.

It would seem, then, that the seasonal rises are not dependent upon the rice-milling industry. What may be the cause or causes for such variations in beriberi incidence in Bangkok are still unknown, and further investigations are desirable in order to elucidate the matter.

(4) *The Death-rate and Ages at Death from Beriberi in Bangkok.*

Hitherto no mention of deaths from beriberi has been made, for obvious reasons. From an epidemiological point of view, say, in trying to estimate seasonal incidence, the death-rate has no value. Not only does this vary from year to year, but also in the same year in different services and institutions. This is often due more to administrative measures than to differences in treatment of the cases. For example, in the Asylum for Insane and in the Hospital for Infectious Diseases we kept our cases till they recovered or died. In the navy and police the men were given leave in great numbers to go home, and so in the case of our asylum and hospital the death-rate far exceeded that of the navy and police. The number of men who died at home is unknown, those who died under our care have been recorded. As I have stated in a former report, the general figures give a death-rate of 4·6 per cent., but this I stated was certainly too low a figure to be true. The returns from our various hospitals give a rate of 26 per cent., while those for the asylum range from 88 per cent. to 78 per cent. of those affected. We may take it, then, that the death-rate is varied and uncertain in Bangkok. As for the ages at which beriberi patients die in Bangkok, we are on more certain ground. During the last two and a half years, during which the Act for Registration of Births and Deaths has been in force, a total of 1,278 deaths have been reported as due to beriberi. Of these, 91·2 per cent. were males and only 8·8 per cent. females. On grouping the deaths according to age periods, we find that only fourteen persons died of this disease at ages under 15 years, while from 16 to 45 years 82·6 per cent. of the total deaths are recorded.

As the deaths amongst the police and the naval men were also in young male adults, it will be seen that our experience tallies with that of neighbouring countries where beriberi is known to affect adult males especially. Infantile beriberi, such as has been lately described in Manila, has not been recognized as yet by medical men in Bangkok.

(5) *Beriberi from an Economic Aspect.*

Two of the most important results of modern sanitation are: (1) The reduction of the annual mortality from diseases which are now recognized as preventable, and also as a consequence of this reduction in death-rate; (2) the greater prolongation of life. Where these results have taken place the financial gain has been enormous owing to the increase in the total years of labour, the greater efficiency of the workers, and the lessened expense in dealing with sickness. It is no wonder, then, that every government encourages any practical measure for the prevention of disease if only to save money. Siam has also taken her part in this work, but much more can yet be done.

During the last eleven years the figures at my disposal give a total of over 33,000 cases of beriberi in Bangkok alone. Many more cases have occurred in the army and in the ordinary civil population of which I have unfortunately no details, but on a very moderate estimate we may take it that 3,000 cases of beriberi arise every year. Beriberi, as we know, tends to be a chronic disease except in severe cases, where death may supervene early. Two, four, or even six months or more are quite common periods during which a sufferer is inefficient for duty. If one allows that each case was unable to work for only one month, then we have the enormous loss of three thousand months of labour or duty in these services during every year. In the eleven years under review we get a total of 33,000 months of invaliding, which is equal to a loss of one year's labour of 2,750 men.

Further, if we grant that each of these young male adults can and does earn Ticals 20 per mensem, the direct financial loss in wages amounts to Ticals 60,000 per annum, or Ticals 660,000 for the total eleven years, which at the present rate of exchange is equal to £49,143.

Nothing has been allowed for such administration charges as cost and upkeep of hospitals, salaries of doctors and attendants, medicines and medical comforts, &c. If we add a sum of Ticals 5 per head, which I know to be a fair amount, judging from the expenses of the hospitals under my charge, we have an additional sum of Ticals 165,000 to add to the 660,000, which produces a grand total of Ticals 825,000 for the eleven years.

It will be remembered that I have not allowed for the army and those civilian cases which have not been treated in hospital, but if we take these to amount to 8,750 cases during the past eleven years (and this is not overestimated, considering the deaths reported during the past three years), and if we allow a loss of Ticals 20 per case for labour, we then find that for the eleven years *a total financial loss of one million ticals* may be estimated to have taken place. As I have already shown that beriberi is a preventable disease, so far as our experience goes, it is surely incumbent upon the Government to take the necessary steps not only to prevent this huge amount of sickness, this considerable death-rate, but also this enormous financial loss to the country. This can be done at a nominal cost.

Siam Rice and its Chemical Composition compared with Burma and Indo-China Rices in their Relation to Beriberi.

It may be remembered that at the first Biennial Congress of the Far Eastern Association of Tropical Medicine held at Manila, Philippine Islands, during March 5 to 14, 1910, the following resolution was adopted:—

"Resolved—That in the opinion of this Association sufficient evidence has now been produced in

support of the view that beriberi is associated with the continuous consumption of white (polished) rice as the staple article of diet, and the Association accordingly desires to bring this matter to the notice of the various Governments concerned."

The attention of His Siamese Majesty's Government was not only drawn to this resolution, but also a copy of Drs. Fraser and Stanton's preliminary report, dated 1909, on "The Etiology of Beriberi," was forwarded by the Government of the Straits Settlements. The result was, as I have already said in my introductory remarks, considerable excitement amongst the rice-millers of Siam. The Siamese Government, too, was no less interested, for at p. 3 of the report referred to we find the following: "From epidemiological considerations and from experimental evidence it appears that Siam rice is considerably more potent in its beriberi-producing powers than Rangoon rice." Again, on the same page, after giving the analysis of white rice (Siam) and white rice (Rangoon), Drs. Fraser and Stanton report that "a comparison of these results shows that the only marked difference among the rices was in respect of fat, which was most abundant in the variety known as Rangoon, less abundant in parboiled rice, and still less abundant in Siam rice."

True it is that in their completed report on "The Etiology of Beriberi"—"Studies from the Institute for Medical Research, Federated Malay States," No. 12—at p. 21 the authors make the following explanation: "We should be glad if it could be made clear that in using these trade terms we do so merely as a convenience and with no intention to suggest that the padi produced in Indo-China or Siam is inferior to that produced elsewhere. Misapprehension has arisen in commercial circles as to the significance of these researches, and the matter has even been the subject of correspondence between the various Governments.

"At the local Agri-Horticultural Exhibitions *Padi Siam* and *Padi Rangoon* grown locally are exhibited amongst a host of others. A certain grain in commerce has come to be associated with these names, and in our use of the terms we do not mean to suggest that they necessarily indicate the country of origin of the rices used in our experiments."

In the absence of such an explanation, Drs. Fraser and Stanton need not be surprised at the matter being taken up so seriously by the Siamese Government. On August 15, 1910, on the initiative of the Minister of Lands and Agriculture, a meeting of the medical men of the country took place "in order," as the letter of invitation says, "that they may have full opportunities for discussing the matter, and that any course of action which they consider advisable may be recommended." Sixteen foreign medical men practising in Siam attended the meeting, and resolutions were passed confirming a scheme of investigation. In accordance with these resolutions samples of rice were purchased in Siam by the Ministry of Agriculture, and in Hong Kong, Singapore, Saigon, and Java, with the assistance of the Consul for Siam in each of these places. Each of these samples was numbered and a portion of each was sent for analysis to the following laboratories:—

(1) The State Analytical Laboratory, Antwerp.

(2) The Institute of Agricultural Chemistry, Berne.

(3) Steins Chemical Laboratory, Copenhagen.

(4) The Institute of Industrial Research, Washington; and

(5) The Laboratory of the Medical Officer of Health, Bangkok.

As different methods of analysis were probably employed in each of these laboratories, one is not surprised that there should be slight differences in the results. The results of analyses of these twenty-seven samples performed by Dr. Rankin were forwarded to the Minister of Lands and Agriculture on October 4, 1911, but as no information beyond an identification number was given with regard to these rices, no general deductions could be drawn until this report was commenced, when the missing details were kindly supplied. The rices hail from three countries: Siam, Saigon (Indo-China), and Rangoon (Burma); 18 from Siam, 3 from Saigon, and 6 from Burma. The following are the results of analysis of each of these three groups, made by Dr. Rankin in the Laboratory of the Medical Officer of Health, Bangkok:—

	Description of sample	Moisture	Proteids	Fat	Carbohydrates	Ash	Phosphorus as P_2O_5
Maximum results	Siam ...	13·40	8	1·34	81·02	0·79	0·32
	Rangoon	12·85	7·39	0·31	80·82	0·73	0·32
	Saigon ..	12·15	7·73	0·32	80·96	0·65	0·26
Minimum results	Siam ..	11·05	7·04	0·22	78·53	0·39	0·14
	Rangoon	11·72	6·59	0·20	78·83	0·38	0·17
	Saigon...	11·60	7 65	0·25	79·42	0·48	0·20
Mean results	Siam ...	12·11	7·45	0·53	79·49	0·52	0·22
	Rangoon	12·33	7·04	0·25	79·87	0·49	0·23
	Saigon..	11·94	7·56	0·28	79 98	0·54	0·22

From these figures it will be seen that, with regard to moisture, the maximum and minimum amounts are to be found in Siam rice; for proteids, Siam rice shows a maximum, while the minimum figure is shown by Rangoon rice; for fat, the maximum for Siam far exceeds that for Rangoon or Saigon, while for phosphorus an equal maximum is shown for Siam and Rangoon rices and a minimum for Siam rice. The means for these samples show that for proteids the order is Saigon, Siam, Rangoon; for fat, Siam, Saigon, Rangoon; and for phosphorus, Rangoon, Siam and Saigon equal, although the difference under this heading is practically *nil*.

On looking at these twenty-seven samples of rice, it is at once apparent to anyone who has had some experience of rice analysis and some knowledge of rice milling that such a comparison as I have just made is not a true one. In this group of samples one can easily detect that the degree of milling has not been uniform.

Colonial Medical Reports.—No. 20.—Siam.— *(continued).*

It appeared to me, therefore, that if any true comparison between the rices of these three countries were to be made, it would be necessary to compare equal exhibits—that is, in this case rices equally milled.

In order to avoid any chance of error or of bias upon my own part, I invoked the aid of two European rice experts. They were asked to separate out all the rices which to them seemed to be equally polished for export.

The average results of analysis have been calculated, and the figures are as follows:—

COMPARISON OF SAMPLES OF RICE FROM SIAM, RANGOON, AND SAIGON, MILLED AND POLISHED APPARENTLY TO THE SAME DEGREE.

(Analysis by Dr. Rankin in the laboratory of the Medical Officer of Health, Bangkok.)

Description of samples	Moisture	Proteid	Fat	Carbo-hydrate	Ash	P_2O_5
Averages of ten samples, Nos. 1—10, of Siam rice purchased in Hong Kong and in Singapore	12·44	7·41	0·38	79·33	0·48	0·21
Averages of four samples, Nos. 12, 13, 14 and 15, of Burma rice for export to China, Europe and America	12·22	6·88	0·22	80·18	0·43	0·20
Averages of two samples, Nos. 18 and 19, of Saigon rice for export to Japan and Europe	11·84	7·69	0·30	80·17	0·49	0·21

From this table it will be seen that the three kinds of rice very closely approach one another in chemical composition when they have been milled to an equal degree, but that fat predominates in Siam rice.

It is apparent then that our results do not tally with those of Doctors Fraser and Stanton, who found that fat "was most abundant in the variety known as Rangoon, less abundant in parboiled rice, and still less abundant in Siam rice."

It may be that they compared a somewhat undermilled Rangoon rice with a highly milled Siam rice, and so got such higher figures for fat as well as for phosphorus. That such a hypothesis is tenable is shown by Dr. Rankin's analysis of sample 16, which our rice experts tell us is the ordinary "Straits and India quality" of Rangoon rice.

Description	Moisture	Proteid	Fat	Carbo-hydrates	Ash	P_2O_5
Rangoon rice (Fraser and Stanton)	14·18	7·3	0·63	77·15	0·74	0·33
Rangoon rice (ordinary Straits and India quality) (Rankin)	12·05	7·3	0·31	79·61	0·73	0·32

With the exception of the figures for "fat" and "moisture," these two samples seem to be identical. As our sample No. 16 was purchased in Rangoon, and as a delay of some months was incurred before it was analysed in our laboratory, it is natural to expect that the moisture would be somewhat less than that found in a fresh sample obtained in the Federated Malay States or in the Straits Settlements. As for the difference in the amount of fat, we agree with Doctors Fraser and Stanton that its estimation is "an extremely tedious process," and therefore subject to varied interpretation by different workers. We may conclude, then, that the samples submitted to us by the Ministry of Agriculture show that Siam rice contains more fat than the product of either Burmah or Indo-China. In two samples of Rangoon rice which are evidently undermilled, the percentage of P_2O_5 is 0·27 and 0·32 respectively. In samples of Siam rice which have been similarly undermilled we find the following proportions of P_2O_5:—

Description	Method of milling	Percentage of P_2O_5
Asylum No. IV ...	Steam-milled by Borneo Co.	0·42
,, No. III ...	,, ,, ,,	0·38
Ministry of Agriculture No. 24	,, ,, Qwang Heng Seng	0·32
Ministry of Agriculture No. 22	Steam-milled by Tai Heng Sing	0·31
Ministry of Agriculture No. 21	Steam-milled by Nguan Tai Seng	0·31
Sample sent to laboratory	Steam-milled by Markwald and Co.	0·30
	Average percentage	0·346

Further, as many of our hand-milled rices contain 0·54 per cent. of phosphorus pentoxide, it will be at once evident that Siam rice *per se* is no more deficient in phosphorus than Rangoon rice. The matter of the phosphorus content of a rice is important in its relation to beriberi, and later on I shall show that our experience tends to confirm the statement made by Fraser and Stanton that "the estimation in terms of phosphorus pentoxide of the total phosphorus content of a given rice may be used as an indicator of the extent to which such a rice has been milled and polished, and therefore of its beriberi producing power when forming the staple of a diet in man." In our opinion, the only

difference is in the degree of milling to which the two rices have been subjected. Milled equally, there is nothing to choose between them. Our interpretation is that there is a difference in the degree of milling, and that Siam rice can be milled to contain as much phosphorus as the less milled Straits and India quality of Rangoon rice. In Fraser and Stanton's only experiment with Rangoon rice the percentage of P_2O_5 amounted to 0·33. No Siam rice containing more than 0·26 per cent. of P_2O_5 is mentioned as having been used by them.

From our many experiences of Siam rice as a prophylactic in man which have already been fully detailed, it must be evident that when sufficiently undermilled Siam rice is as potent in preventing as it is potent in causing beriberi when it is highly polished.

Finally, in neither the preliminary nor in the completed report can I find that Fraser and Stanton have brought forward any evidence to prove that "from epidemiological considerations Siam rice is considerably more potent in its beriberi-producing powers than Rangoon rice." On the other hand, our epidemiological evidence of the preventive powers of Siam rice is fairly complete.

Doubtless Doctors Fraser and Stanton will consider that I have taken up their use of the term "Siam rice" too seriously, considering the fact that from their own explanation they do not really mean that such rice has actually come from Siam. The rice millers of Siam, however, feel that their produce has been discredited.

In our opinion it would be better to mention no names, but to keep to the real test as to whether a rice is overmilled or undermilled. By so doing there will be less chance of offending national sensitiveness.

The White-polished-Rice Theory of the Etiology of Beriberi and the Value of the Phosphorus Content as an Indicator of the Degree of Milling and of the Beriberi-producing Powers of a given Rice.

In the preceding chapter I have already quoted the resolution adopted by the Far Eastern Association of Tropical Medicine at Manilla in 1910. Additional emphasis has been given to this resolution by the members of the same association at the Second Biennial Congress, which was held at Hongkong from January 20 to January 27, 1912, when the following was resolved:—

"That the accuracy of the opinion of this Association, recorded in 1910, has received further and more complete confirmation by investigators in Japan, China, French Indo-China, the Philippine Islands, Siam, Netherlands India, the Straits Settlements and the Federated Malay States, namely, that beriberi is associated with the continuous consumption of white (polished) rice as the staple article of diet. It is therefore again desirous to bring this opinion to the notice of the various Governments concerned and to recommend international action."

With such a weight of international opinion behind it, a resolution of this nature cannot be ignored. Before discussing the evidence in its favour from Siam, I think it well to clear away certain misconceptions which have arisen in Bangkok with reference to these resolutions.

What is really meant by the resolution is that under certain conditions beriberi affects many of those who consume this form of rice as the staple article of diet. In my own mind, these favouring conditions are principally sameness of diet, associated with a deficiency of such articles of food as supply the nourishing properties which have been lost in the process of polishing or overmilling of the white rice. Such rice would appear to be perfectly harmless provided the consumer can afford to augment his diet with plenty of accessories by which the deficiency is made up.

The evidence from Siam in favour of this theory has already been detailed, but it will be advantageous to give here a *résumé* of the evidence, and in order to avoid unnecessary repetition to give also data with regard to the phosphorus content of the rices used.

Take first the experience in the Asylum for the Insane as shown in Chart I and Table IV with a daily average of 260 inmates. Although only three years are shown during which white rice was consumed, it should be remembered that the same rice had been eaten for many years before this, and that beriberi had prevailed ever since its use was commenced. What the phosphorus content of this rice was formerly we had no means of knowing, but when it was analysed by us it was found to contain 0·25 per cent. of P_2O_5. As Table I shows that polished Siam rice may contain anything from 0·14 to 0·26 per cent., we may take it that 0·25 per cent. was rather a high average, and yet beriberi was a positive curse. When parboiled rice containing 0·55 per cent. of P_2O_5 was commenced in February, 1909, the disease disappeared and continued in abeyance during the four and a half months in which it was consumed. Hand-milled rice was next tried, and was so undermilled as to contain 0·39 per cent. of P_2O_5, and beriberi still kept away during the twelve months of its trial. Then started the trials with undermilled rice prepared in the Borneo Company's steam mill. Sample No. 1, containing 0·27 per cent. P_2O_5, was followed in about six weeks by three cases of beriberi; sample No. 2, with 0·33 per cent. P_2O_5, did not prevent the disease; and on sample No. 3, containing 0·38 per cent. P_2O_5, two cases of beriberi were detected. It was not attempted to prove whether the last sample would have been sufficiently undermilled to prevent the disease, but sample No. 4, containing 0·42 per cent. P_2O_5, was supplied from October 8. Four cases developed upon this rice, but as I have already said, they developed in patients in poor health, and the chances are that they were slowly developing cases, the result of the use of samples 1 and 2. Anyhow, for eight months no more beriberi occurred on this asylum No. 4 rice containing 0·42 per cent. P_2O_5. On the failure of the Borneo Company to supply any more of this rice, the best garden rice was used

FIG. 1. —Anopheline pools at Gereif.

FIG. 2.—Infested "khor" at Gereif.

FIG. 3.—Infested "khor" at Gereif. Mosquito brigade in action.

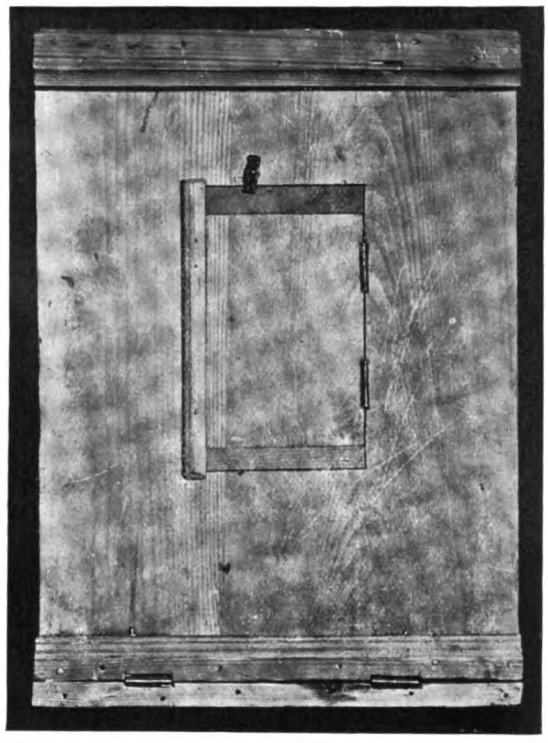

FIG. 4.—Mosquito trap closed.

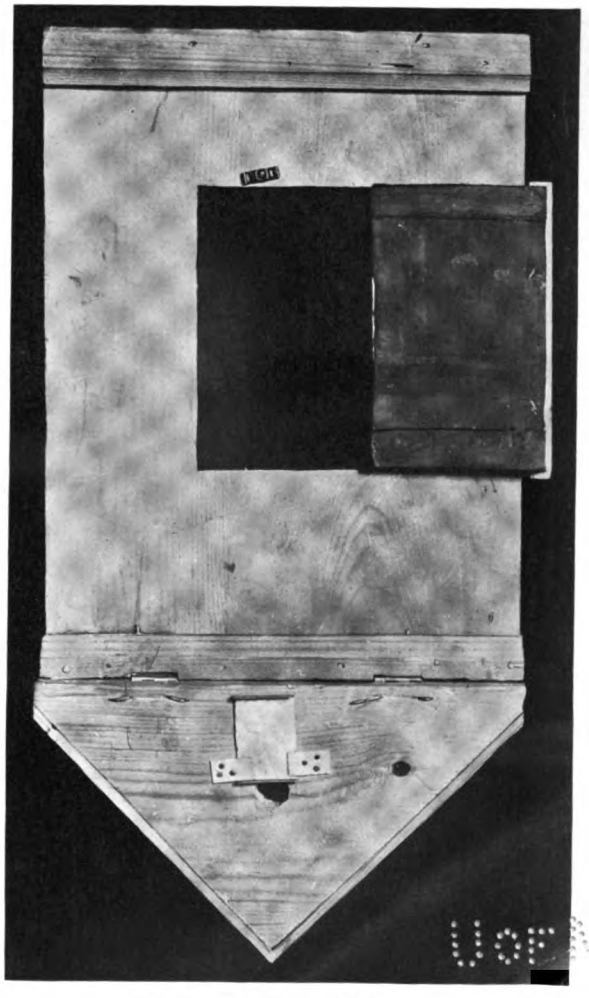

FIG. 5.—Mosquito trap open.

To illustrate article, "A Year's Anti-malarial Work at Khartoum," by ANDREW BALFOUR, C.M.G., M.D., B.Sc., F.R.C.P.E., D.P.H.

containing 0·25 per cent. P_2O_5, and seventy-four days later the disease again broke out. On the addition of "polishings," and later on by the substitution of undermilled rice prepared by hand and containing 0·4 per cent. P_2O_5, beriberi was again checked, and has remained in abeyance for six months up to date.

The epidemic at the Police School developed on ordinary white polished rice which was not analysed, but which, it may be presumed, did not contain any more than 0·26 per cent. P_2O_5, like other white polished rices since analysed. Since undermilled rice was substituted there have been only ten cases of beriberi in this institution, with a daily average of from 300 to 800 men. The rice has generally contained 0·4 per cent. P_2O_5.

At the Customs Barracks, with a daily average of 200 men, beriberi persisted upon white polished rice, but ceased on the men being entirely supplied with Asylum No. 4 rice, which contained 0·42 per cent. P_2O_5. On the resumption of white polished rice beriberi returned, and continues to be present on this rice.

In Minburi Gaol during the past four years fresh hand-milled rice has been continuously consumed, and only one case has been reported. The rice has been analysed on two occasions, when it was found to contain 0·29 per cent. and 0·30 per cent. P_2O_5. Here the daily average number of prisoners is 80.

In Tanyaburi Gaol, with a daily average of 147 prisoners, where also hand-milled rice is used, two cases have developed during the last four years. Here the phosphorus pentoxide has been found to range between 0·34 per cent. and 0·54 per cent.

In Pratoomtani Gaol, during three and a half years on hand-milled rice, six cases of beriberi are reported on a daily average of 50 prisoners. The phosphorus content for this rice is equal to 0·37 per cent. P_2O_5. In September, 1911, as I have already shown, white polished rice had to be supplied owing to the lack of padi in the local market, with the result that beriberi developed. This rice was found to contain only 0·20 per cent. P_2O_5.

In Nontaburi Gaol, while the usual white polished rice of the Bangkok market was in use, fifty-nine cases of beriberi were reported during a period of a little under three years. When hand-milled rice containing on an average 0·37 per cent. P_2O_5 was supplied, only one case developed during one year. Here the daily average is 120 prisoners.

In Paklat Gaol, with a daily average of 80 prisoners on hand-milled rice containing 0·36 per cent. to 0·44 per cent. P_2O_5, no case occurred during the three and a half years in which only this rice was used. When white polished rice from Bangkok was supplied in September, 1911, beriberi appeared for the first time in this gaol.

In Paknam Gaol white polished rice was in use during one year, when seven cases occurred. During the following three years on hand-milled rice containing 0·4 per cent. to 0·42 per cent. P_2O_5, beriberi had disappeared entirely. The daily average of prisoners is here 217.

In the Bangkok Prison only five cases are reported to have arisen in the gaol during the past five years. The rice is milled by hand in the prison, and contains as a rule 0·43 per cent. P_2O_5. The daily average of prisoners is here 1,819.

In the Bangkok Central Gaol, where also the rice is prepared by hand and contains on an average 0·42 per cent. of P_2O_5, no case has arisen during the five years for which records are available, on a daily average of 1,500 prisoners.

Why only one case of beriberi was noted in Minburi Gaol during four years on a rice containing no more than 0·29 to 0·30 per cent. P_2O_5 I am not prepared to say. I have no data to show that the diet in this gaol has been uniformly richer and more varied than in the other gaols. That the Minburi rice is more milled than the other gaol rices is shown by its appearance and by the lesser quantity of its phosphorus content, but as we have as yet no means of separating out the "protective substances," it would be futile to speculate further on this matter.

However, to sum up, I think that one must grant that our experience in Siam corroborates that of Fraser and Stanton and of many other workers in their condemnation of a white (polished) rice diet as a staple, and further, that the amount of phosphorus calculated as P_2O_5 is a good working guide as to the beriberi-producing properties of a rice. Finally, our average figure of 0·4 per cent. P_2O_5 as a safe percentage may be taken as further evidence in favour of Fraser and Stanton's conclusion as follows: "In the examination of a large number of rices, none were found associated with human beriberi or polyneuritis in fowls which yielded a phosphorus pentoxide content of 0·4 per cent. or over, as estimated on the undried material." A similar figure has been reached independently by Dr. Aron, of Manila, as a result of a series of experiments conducted upon chickens.

Beriberi and Legislation.

When medical science has shown that a disease can and may be prevented, it is natural that the Government of every country in which such a disease is prevalent should desire to give effect to preventive measures by means of legislation. That beriberi can be prevented has been definitely shown in the foregoing pages, but that our knowledge of the disease is sufficiently complete to warrant legislation is a question which many may not yet be willing to answer in the affirmative.

At the Second Biennial Congress of the Far Eastern Association of Tropical Medicine at Hongkong in January, 1912, a paper was read by Dr. Victor G. Heiser, Director of the Bureau of Health for the Philippine Islands. This paper is entitled "Beriberi: With a Suggestion for Government Aid in its Eradication."

Dr. Heiser is peculiarly competent to speak on this subject because it was owing principally to his advice, as a result of the evidence produced at the First Biennial Congress of the above-mentioned Association at Manila in March, 1910, that the Government of the Philippine Islands issued a

General Order forbidding the use of white polished rice in all Government institutions. The result of this Order is given by Dr. Heiser in the paper referred to, where he says: "In spite of the remarkable success in reducing the number of beriberi cases that occurred in the military and civil establishments in the Philippines soon after the use of undermilled rice was made compulsory, it early became apparent that only by the most urgent insistence could its continuous use in even such circles be brought about. . . . Since it had been so difficult to bring about the use of unpolished rice among persons for whom the Government furnished the rations, and whom it was possible to reach so directly by education, it was apparent that at best the adoption of unpolished rice by the masses would necessarily be slow."

In the Straits Settlements and the Federated Malay States excellent results have been experienced in all the Government institutions such as gaols, hospitals, asylums, &c., in which parboiled rice has alone been supplied. These experiences tally with our results in Siam in those institutions where we have been able to fully control the kind of rice consumed.

The position is entirely altered when we come to deal with the general public. Are we to wait until the people have been educated to understand the value of unpolished rice as a prophylactic against beriberi, or should the Government step in and try to force the pace by means of legislation?

Granted that legislation is advisable, upon what scientific basis is the law to be drafted? In the present state of our knowledge of the disease the only possible basis is that of the "polished rice" theory. If they accept this view, legislators must next define clearly what is meant according to the meaning of the law by the term "polished rice." As Dr. Heiser says, "In the first place, in order that there might be a standard as to what constituted polished or unpolished, or overmilled or undermilled rice, Dr. Aron, of the College of Medicine and Surgery of the University of the Philippines, undertook a series of experiments on chickens, as a result of which he came to the conclusion that any rice which contained 0·4 or 1 per cent. of phosphorus pentoxide or more might be regarded as undermilled rice, and therefore safe as a staple article of diet, and that any rice that contained less than this percentage of phosphorus pentoxide should be regarded as overmilled rice, and therefore unsafe as a staple article of diet."

On the same point I have already quoted Fraser and Stanton, who state that "In the examination of a large number of rices, none were found associated with human beriberi or polyneuritis in fowls which yielded a phosphorus pentoxide content of 0·4 per cent., as estimated on the undried material." Valuable as these findings are from Manila and Kuala Lumpur, it should be clearly noted that they are based chiefly upon experiments upon fowls.

Let it be remembered, too, that the fowls experimented upon were given nothing but water and the rice under trial. How different are these conditions from those under which human beings develop beriberi! We know definitely the actual amounts of the different elements supplied to the fowls under observation, but in the case of human beings we are in the dark unless we carry out a complete series of analyses of the foodstuffs.

I grant that the experiments upon fowls prove that polyneuritis remains in abeyance so long as the rice contains 0·4 per cent. or over of phosphorus pentoxide, but it must be noted that this rice comprises the sole food of the fowl. Upon this basis one could legislate for fowls, but can we apply the same standard to human beings? It surely seems premature to do so, and I would advise caution until we know more about the percentage of phosphorus pentoxide as an indicator of the beriberi producing powers of a rice *in man*.

I have given a considerable amount of evidence which tends to corroborate not only the polished rice theory, but also the actual standard of phosphorus pentoxide which has been fixed. I have said nothing about our experiments upon fowls—the results of which were the same as those of other observers, but I would lay stress upon the fact that all our results are based on observations upon human beings only. It has been shown that the amount of phosphorus pentoxide is a good working guide to the beriberi producing properties of a rice, and that the average percentage for a safe rice in our experience is 0·4 per cent. Minburi Gaol rice contained only 0·29 to 0·30 per cent. P_2O_5, and yet there was no beriberi. It may well happen that further observations in other countries may give an equally low content of P_2O_5 in a rice which does not produce beriberi. If other observers confirm our results of observations on human beings, then the standard of 0·4 per cent. P_2O_5 will be of far greater value than if determined upon fowls alone, and legislators will be able to work upon a surer basis.

But as the amount of phosphorus present in a rice is only an indicator as to its beriberi preventing property, and as it has been definitely proven by Fraser and Stanton and others that phosphorus itself is not the protective substance, would it not be safer to wait until the real protective substance has been identified and separated before attempting to lay down a standard satisfactory to legislators and to commercial men?

Fraser and Stanton have narrowed the search down to substances which are soluble in 0·3 per cent. hydrochloric acid, in 91 per cent. acidulated alcohol, and which, exclusive of dextrose, do not amount to more than 1 per cent. of the original grain. Funk, in the *Journal of Physiology*, 1911, No. 43, page 395, states that the protective substance is present only in minute amount, probably not more than 0·1 grm. per kilo of rice, that it is an organic basis, and that he has prepared a crystalline nitrate from it. His investigations are not yet completed, but enough has been said to show that we may hope for an early solution of the etiology of beriberi.

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(continued).

My own view is that in rice-producing countries legislation against polished rice is a practical impossibility. One might as well plead for legislation in bread-eating countries on behalf of "standard bread." Polished rice is eaten largely in the former and white bread in the latter countries with impunity, and yet in the Philippines a tax on polished rice has been proposed. The administrative difficulties are so great that for Siam, anyhow, I would not advise legislation. Let the Siamese Government encourage the use of undermilled rice by every possible means, and preferably by a general order (as in the Philippines) forbidding the use in Government services and institutions of rice containing less than 0·4 per cent. phosphorus pentoxide. The educative effect of such an order would in time prove of great value, and the Government would not be bound down by legislation which might possibly require to be repealed or amended in the light of further research.

In the meantime, while the amount of P_2O_5 is our only working standard, I would plead for a common method of analysis if any comparisons are to be made between the results of different observers, and more especially if any administrative action is to be taken on this basis, while differences in results may be found even in the work of able chemists.

THE POSITION OF SIAM RICE WITH RESPECT TO BERIBERI LEGISLATION.

The composition of Siam rice has been already fully considered, especially with reference to the statements of Fraser and Stanton, with regard to its potency as a beriberi-producing agent. We have shown that the term "Siam rice" was used by these authors to indicate a highly polished grain of a special character, and we have further shown that when equal comparisons are made with Rangoon and Saigon rice our local product compares very favourably with these rices, and should be just as efficient as a prophylactic agent. We have also shown that the rice mills of Bangkok can easily prepare from Siam padi a rice which fulfils the standard of 0·4 per cent. P_2O_5; and may therefore be considered safe. This rice can be prepared on a commercial basis in Bangkok without the least difficulty, provided there be a demand for it. This is the opinion expressed to me by every rice miller whom I have consulted on the matter. Further, our own experience of our asylum rice has been amply confirmed by Dr. H. J. Gibbs, the Medical Superintendent of the Singapore Lunatic Asylum. In the *Transactions of the Society of Tropical Medicine and Hygiene*, vol. v, No. 2, we find in a paper by Dr. Gibbs the following note—Note 11: "In December, 1910, at the suggestion of Dr. Highet, of Bangkok, and with his assistance, a supply of undermilled partially polished Siam rice was obtained. This variety is free from the objectionable odour of parboiled rice, is therefore considerably more palatable, and no bad results have followed its use."

It will be seen, therefore, that the alarm of our local rice millers on the reception of the copy of Fraser and Stanton's provisional pamphlet from the Straits Government was altogether unnecessary.

As I have always said, Siam rice has nothing to fear in competition with the rice of any other country, and no matter how legislation against beriberi is drafted, Siam rice can meet any requirements which deal equally with the rice of other countries.

CONCLUSIONS.

From the data supplied, one is amply justified in coming to the following conclusions:—

(1) That beriberi as a cause of sickness and death, not only in Bangkok, but also in other parts of Siam, is a disease of such importance as to call for the serious attention of His Majesty's Government.

(2) That we are convinced of the correctness as a working basis of the theory that beriberi is associated with the continued consumption of white (polished) rice as a staple diet in man, provided certain other supplemental and necessary ingredients of diet are consumed in insufficient quantity.

(3) That we agree with other investigators that the amount of phosphorus in a given rice is a good indicator of its beriberi-producing properties, and that a rice which contains less than 0·4 per cent. of phosphorus pentoxide is likely to cause beriberi under the conditions described in conclusion 2.

(4) That Siam rice compares most favourably with the rice of neighbouring countries, and when not milled beyond the standard of phosphorus pentoxide already mentioned is as excellent a prophylactic against beriberi as the rice of any other country.

(5) That a beriberi-preventing rice can readily be prepared from Siam padi either by hand-mill or steam-mill, and that the padi need not be previously parboiled.

(6) That the incubation period of beriberi in Siam is roughly sixty days.

(7) That there is a definite seasonal incidence of the disease in Bangkok, with a maximum rise during September, and two secondary rises, one in March and one in May, and that the cause of these variations is not apparent.

(8) That the deaths from beriberi are mostly amongst young adult males, 82·6 per cent. being at ages ranging from 16 to 45 years, but why is not yet known.

(9) That beriberi costs the Government at least sixty thousand ticals per annum, and that a modest estimate gives for the past eleven years a total financial loss of one million ticals.

(10) That our knowledge of the ultimate substance in unpolished rice which prevents beriberi is still insufficient to guide legislators in framing an Anti-beriberi Law.

(11) That the rice millers of Siam can await any such legislation without fear of damage to their trade.

Return of Diseases and Deaths in 1910 amongst Europeans in the Hospitals in Basutoland.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	22	—	22
Anæmia	4	—	450
Anthrax	2	—	2
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	11	—	526
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	1	—	4
Diabetes Insipidus	—	—	—
Diphtheria	1	—	25
Dysentery	11	—	128
Enteric Fever	26	2	65
Erysipelas	11	—	11
Febricula	14	1	321
Filariasis	—	—	—
Gonorrhœa	10	—	1,088
Gout	—	—	24
Hydrophobia	—	—	—
Influenza	4	—	517
Kala Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	8	—	8
(*b*) Anæsthetic	1	—	6
(*c*) Mixed	21	—	21
Malarial Fever—	1	—	5
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	2	—	3
Measles	12	—	12
Mumps	—	—	62
New Growths—	—	—	—
Non-malignant	95	—	221
Malignant	17	4	29
Old Age	—	—	—
Other Diseases	—	—	—
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	1	1	20
Rachitis	9	—	9
Rheumatic Fever	—	—	—
Rheumatism	22	—	267
Rheumatoid Arthritis	—	—	—
Scarlet Fever	6	—	6
Scurvy	1	—	33
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	—	—	—
Syphilis	—	—	—
(*a*) Primary	11	—	11
(*b*) Secondary	4	—	1,047
(*c*) Tertiary	20	1	687
(*d*) Congenital	942	—	942
Tetanus	1	—	1
Trypanosoma Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	27	2	155
(*b*) Tuberculosis of Glands	48	1	138
(*c*) Lupus	—	—	—
(*d*) Tabes Mesenterica	8	1	17
(*e*) Tuberculous Disease of Bones	12	—	29
Other Tubercular Diseases	—	—	—
Varicella	32	—	32
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	100	—	726
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	36	3	179
(*b*) Other Diseases	14	1	110
Digestive System—	—	—	—
(*a*) Diarrhœa	72	1	2,343
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	13	2	136
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	29	1	6,619
Ear	5	—	530
Eye	65	—	869
Generative System—	—	—	—
Male Organs	60	4	231
Female Organs	218	9	2,030
Lymphatic System	11	—	244
Mental Diseases	—	—	—
Nervous System	36	5	668
Nose	14	—	615
Organs of Locomotion	83	—	325
Respiratory System	85	3	3,795
Skin—	—	—	—
(*a*) Scabies	—	—	398
(*b*) Ringworm	1	—	61
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	3
(*e*) Eczema	5	—	592
(*f*) Other Diseases	10	—	1,234
Urinary System	10	—	115
Injuries, General, Local—	121	2	850
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	4	—	187
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	1	—	21
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	2,398
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

(12) That although legislation against white polished rice be somewhat premature, much good might be done if the use of this kind of rice were prohibited in all Government services and institutions, and only undermilled rice containing at least 0·4 per cent. of phosphorus pentoxide were permitted.

This is already done in Bangkok and Muang Gaols, in the Police School, the Police Hospital, the Asylum for the Insane, the Hospital for Infectious Diseases, and in the reformatory and police-station at Koh Si Chang. Practically the whole of the Provincial Gendarmery subsists upon undermilled rice with almost total absence of beriberi amongst nearly 9,000 men. Were the Army and Navy* to follow suit beriberi cases in Bangkok would fall to a very small figure, and in time the force of education would come into play in further lessening the death-roll from this, which has been proven to be a preventible disease.

* Since writing the above, I have been officially informed that the Naval Department has substituted hand-milled for white polished rice.

Colonial Medical Reports.—No. 21.—Basutoland.*

MEDICAL REPORT FOR THE YEAR 1910.

By EDWARD C. LONG,

Principal Medical Officer.

Population and Vital Statistics.

In the absence of any registration of births and deaths no trustworthy information is available.

A census of the Maseru Reserve was made towards the end of 1909 and each individual supplied with a census paper with instructions for the head of each household to return the same in the event of any death occurring. Information concerning births was also sought. There being no law to enforce the observance of these instructions, very little useful information was obtained, only a few papers having been returned. The system is, however, capable of development and if made compulsory some vital statistics would be available from limited areas, and such areas could be extended from year to year.

General Health.

The general health of the Territory has been good. There have been no epidemics of importance. There was no small-pox and only a few sporadic cases of chicken-pox.

Infantile diarrhœa was less prevalent than usual, but there were the usual number of bronchial affections in the winter months. These two diseases are responsible for most of the deaths amongst children.

Syphilis still figures largely in the nosological return, forming nearly 10 per cent. of the out-patients. The natives seek advice for this complaint much earlier than was the case some years ago, with the result that the type of case which comes under our notice is much less severe than we were formerly accustomed to treat. "606" has not yet been tried, as it is difficult to induce syphilitic patients to submit to hospital treatment.

A considerable number of cancer cases were seen during the year. They formed 1 per cent. of the total admissions to hospital. Unfortunately the majority of cases were too advanced to admit of operation.

I do not think that cancer is increasing in the Territory, but we see more cases owing to the greater readiness of the people to avail themselves of hospital treatment. Comparatively few vaccinations were performed, as the continued absence of small-pox makes the people less ready to avail themselves of this preventive measure.

Tuberculosis is still common, but is not, I think, spreading to any extent. As noted in previous reports, the majority of cases are those in which the glands are affected. A few cases of miner's phthisis have been received in hospital.

There have not been many cases of scurvy. In former years we used to receive a good many cases of scurvy from the mines, now they are extremely rare.

Enteric fever has been less common than usual; and the imported cases are few in number.

* The portion of this Report dealing with Leprosy has already appeared in these pages.—Ed.

Colonial Medical Reports.—No. 22.—Gambia.

MEDICAL REPORT FOR THE YEAR 1910.

By T. HOOD,

Senior Medical Officer.

General Remarks.

The general health of the inhabitants of the Colony and Protectorate has been good. Record crops of ground nuts have been disposed of at remunerative prices, with the result that the people seemed well able to provide themselves with the necessaries of life.

General Diseases.

Diseases of the digestive organs are prevalent throughout the year, due most probably to bad cooking and the want of variety in foodstuffs.

In the Harmattan diseases of the respiratory system are prevalent, owing to dust irritation and partly to the rather large diurnal variation of temperature. The many cases of conjunctivitis that are seen occur mostly at the height of the Harmattan. The aboriginal natives, especially the Jolas and Sererais, are not given to bodily cleanliness, and in consequence suffer a great deal from scabies and other skin troubles. In the rains rheumatism, seldom in a very acute form, is a disease of common occurrence.

Communicable Diseases.

Insect-borne diseases, except malaria, do not appear to be so prevalent as one would expect, and the natives of the place regard somewhat lightly an attack of fever.

Fortunately, although yellow fever is said to be endemic, no suspicion of such a case has occurred in the Gambia during the past four years; this is somewhat remarkable, considering that the stegomyia is the most numerous of all mosquitoes in Bathurst.

As regards trypanosomiasis it is impossible to make any definite statement at present beyond that cases are found occasionally in the Protectorate, and that the *Glossina palpalis* and *Glossina morsitans* are very prevalent all along the banks of the river and its tributaries. I attach hereto a very interesting report on sleeping sickness in the Gambia by Dr. Hopkinson, D.S.O., the Protectorate Medical Officer.*

The Colony has been free from all infectious diseases this year, except for a mild outbreak of small-pox that occurred amongst the West African Frontier Force in the Protectorate at the Cape St. Mary Camp. Three Frontier soldiers and a groom were attacked, but fortunately the disease did not spread and the patients all recovered.

Helminthic diseases are not uncommon amongst the native population. Bilharzia hæmatobia has been looked for but never found. The most prevailing nematode is the *Ascaris lumbricoides*, and one can hardly be surprised at this when one considers the insanitary conditions in which native food supplies are allowed to lie about, and the careless manner in which such are so often prepared. Ankylostomiasis in an advanced degree is apparently rare; the people in the Gambia for eight months in the year live in a fairly dry atmosphere, and the native hut, being made of a coarsely platted bamboo, is by no means dark or damp. The few cases in which ankylostome eggs have been seen have been found accidentally. Occasionally a case of guinea-worm is seen in this Colony, but such patients as a rule have come recently from lower down the coast. Of the cestodes the *Tænia solium* is fairly common, and it is remarkable that not more cases of this infection are seen in the medical department, as pigs are reared in compounds close to human habitation, and under conditions so favourable to the propagation of tape-worm. The new Public Health Ordinance will prohibit the keeping of swine in Bathurst.

Tænia mediocanellata is apparently rare in the Gambia, although cattle are reared in large numbers. In the market carcases are examined daily by a Medical Officer, but none has been found infected with a cysticercus during 1910. No patient with hydatids has been under treatment in recent years.

European Officials.

The health of European officials has been extremely good during the year. Of the 19 placed on the sick list there were five cases of malarial infection of a benign type and one case of blackwater fever; the latter had been residing at the West African Frontier Force Camp, seven or eight miles from Bathurst, for the previous six months, and was invalided home when convalescent. I attribute the excellent health that prevails amongst the European officials mainly to the regular taking of quinine, and the methods adopted in screening them from mosquitoes, and in addition to the exercise resulting from the general participation in the various kinds of sports that the Colony affords.

Native Officials.

On the whole the native officials enjoy good health; and if more of them would rely on the efficacy of quinine, by taking it regularly throughout the year, there would have been considerably less fever cases to record. As it is no less than 74, or over 50 per cent. of the cases of sickness, were for fever, resulting in the loss of 216 working days and a general enfeeblement of those affected.

* This has already appeared in our pages.

Colonial Medical Reports.—No. 22.—Gambia.— *(continued).*

General European Population.

Europeans attached to the firms have not suffered to any great extent from climatic troubles this year. Many live in isolated factories along the banks of the river during the trading season (October to May) and not under too favourable conditions. All the firms provide quinine and mosquito nets for the use of their employees and it is generally recognized that disregard of either proves disastrous.

General Native Population.

Registration of births and deaths is compulsory in the Colony, but I fear it is not very reliably carried out. The records for the last ten years indicate an excess of deaths over births by 338, but possibly this is accounted for by the deaths of temporary labourers and others from the Protectorate that annually visit the Colony and by the neglect in registering all births that occur. In a Colony of this size, where communications with the Protectorate and the neighbouring French territories are so free and easy, it is difficult to say whether the population is increasing or decreasing, except by means of a census, but the impression prevails that the recent years of prosperity, peace, and freedom from serious epidemics, have not diminished the number of the inhabitants of the country.

I drew attention in my last report to the lack of midwifery facilities in the Colony, and I am glad to state that the provision of a lying-in and a delivering ward, to be attached to the Victoria Hospital, is now under consideration.

Sanitation.

The sanitary work of Bathurst is still controlled by the Board of Health, consisting of the Senior Medical Officer, Chairman, and the Colonial Engineer ex-officio, and not more than six members appointed by the Governor.

During the year a senior sanitary officer has been appointed for Sierra Leone and Gambia, but his duties are for the present advisory rather than executive as regards Gambia.

A European town warden for Bathurst has also been appointed this year, and his duties will include the superintendence of all sanitary work.

A new Public Health Ordinance has been passed by the Legislative Council this year and, when it comes into force, will enable more active measures to be taken again against people who admit mosquitoes to breed on their premises.

The yards and compounds of the town are constantly inspected, and it is seldom that larvæ are not found in the country jars that are usually used for the storage of water. Many of the inhabitants are too poor to provide themselves with proper water vessels, and movable lids appear to be never in position.

Quinine has been administered regularly during term time to the school children, and many children have attended hospital for quinine during the holidays. All the school managers recognize the importance of the children taking quinine regularly and attribute their improved health and better attendance to it. Although very few children were reported absent from school for fever, it was found, on examination, that 16 per cent. of the children possessed enlarged spleens even after administration of quinine for twelve months.

The public generally are beginning to realize the benefits to be derived from taking quinine regularly, especially now that it can be obtained free from the hospital.

All Government officials are now provided with two well-made mosquito-proof enclosures—one to sleep in, and the other to sit in during the day time when mosquitoes are troublesome. Unfortunately, officials are obliged to live in quarters too close to houses occupied by natives, but these mosquito houses, if put to their proper use—and I am glad to state that they are—should considerably lessen the chances of contracting malaria.

During the month of February a small outbreak of small-pox occurred among the West African Frontier Force at Cape St. Mary Camp; every precaution was taken to prevent an epidemic, and only three soldiers and one horseman were attacked by the disease, and all made a good recovery. No other case of small-pox was reported in the Protectorate.

There were 1,011 vaccinations performed by the Public Vaccinators in Bathurst, and 336 by the Commissioners and Protectorate Medical Officer in the Protectorate.

The lymph was imported, as in previous years, from the Incorporated Liverpool Institute of Comparative Pathology, but although the same precautions were taken to preserve its activity, the results obtained were not so good as last year, and, unfortunately, the number of vaccinations performed in the Protectorate this year has greatly fallen off.

The disposal of sewage still causes anxiety; badly constructed cesspits are prevalent. Government quarters and merchants' premises are provided with night-soil pans, which are emptied into the river every night, and a few of the better class natives are also provided with similar means for the disposal of sewage, but the majority find it too costly, and are content with the usual badly constructed cesspit.

There are nine public latrines, each containing six seats: seven are built over the water and two are situated on land. They are all kept clean by the Board of Health. One new latrine has been built during the year, and has resulted in an improved sanitary condition of the neighbouring streets.

Three hundred galvanized iron night-soil pails were ordered from England this year, but unfortunately, were lost on the s.s. "Axim" that foundered at sea. When these articles arrive an attempt will be made in a systematic way to deal with sewage, as money has been provided in the 1911 estimates for this object.

Forty-seven notices to abate nuisances were distributed during the year—eight summonses were served, and five convictions obtained.

The purchase of 500 galvanized iron dustbins has greatly facilitated the collection of old tins and bottles and other household refuse. Each yard in a large area

of the town has been supplied with a bin, and the condition of these yards has noticeably improved.

The erection of three incinerators—two of which are in use, at convenient places—saves much labour and considerably expedites the removal of rubbish. The incinerators are of simple construction in brick, and many loads of refuse are destroyed quickly, instead of being taken a long distance to the swamp, to disintegrate slowly in an unsightly manner. Another advantage is that the ashes are useful for filling in depressions.

The water supply of Bathurst is still unsatisfactory and very insufficient. From the grant of £1,000, thirty-five 400-gallon tanks were imported, and these have been purchased by persons who are refunding the cost by instalments.

Unless some large scheme for a water supply is taken in hand, I am of opinion that the distribution of water tanks should be encouraged and persevered with. Many of the poorer classes would avail themselves of this method of storing rain water for drinking purposes, if the Government would import the tanks, and accept repayment by small instalments.

The public wells are gradually being fitted with Jonot's elevators; six have been done in the course of a year; they are very efficient in preventing further pollution of the water.

I should point out that the measures suggested, and that are being adopted, to improve the water supply of Bathurst are very inadequate, and never can be regarded as satisfactory; a comprehensive scheme should certainly be carried out when funds are available.

The surface drainage of the town is still in an unsatisfactory state. In the Half Die area a tram line was temporarily laid down to the beach to enable people to bring sand to their yards, for the purpose of raising the level of them, and to some slight extent it was used.

During the heavy rains a large area of Bathurst is flooded, and impossible to deal with except by filling in.

A new plan of Bathurst is being prepared, and among other things, it will indicate the areas that are low and impossible to drain. The positions of cesspits and surface wells will also be shown which will be of immense assistance to the Board of Health.

The swamp at Half Die, some ten acres in extent, has been cleared of all mangrove trees, and there is now no cover for tsetse-flies in this part of the town.

Rank vegetation is cut down at regular intervals, and during the rains an extra gang of labourers is taken on for this purpose.

Lectures.

Two courses of lectures were delivered to school teachers during the year, but the attendances were irregular, and after the examination it was found that no candidate had gained sufficient marks to obtain a first class certificate, and until elementary hygiene and sanitation is made a compulsory subject for the children to be taught at school I do not anticipate this subject will be taken up seriously by the teachers, or that a useful knowledge of it will ever be obtained by the children.

The filling in and reclamation of large areas of Bathurst, and a water supply, I regard as the two most important and essential requirements from a sanitary point of view.

The appointment of a sanitary officer solely for the Gambia becomes a necessity, if sanitation in the Protectorate is to receive serious attention.

Meteorological observations have been regularly made at Bathurst and McCarthy Island. It may be of some interest to remark that the average minimum and maximum temperature for the year in Bathurst was two degrees higher than last year, and that in comparison with the records taken at McCarthy Island, some 150 miles up the river, the average range of temperature is 33 and 40·6 F. respectively.

The Victoria General Hospital, Bathurst.

All the buildings have been kept in good repair; the walls have been coated with calcarium and the wood work painted.

On account of the occurrence of yellow fever in Sierra Leone it was considered desirable to mosquito-proof three of the wards, and we are now in a position to segregate, at a moment's notice, twenty or more patients, in the event of yellow fever breaking out at Bathurst.

The mosquito-proofed wards are much appreciated by the patients when mosquitoes are prevalent in the rains, and I hope eventually to see all the wards of the hospital treated in the same way.

In the Out-Patient Department, 7,440 new cases were attended to, and 669 new cases were admitted to hospital this year, compared with 7,324 and 666 respectively in the previous one.

The number of deaths in hospital have fallen off, but this probably is due to old and decrepit patients being transferred to the Home for Destitutes.

The Home for the Afflicted and Destitute.

During the year four men and four women were admitted into the Home, making a total of eighteen with the ten remaining over from the previous year.

Every care and kindness are shown to the inmates by the attendant in charge, but the number of deaths has been high.

Of the four that were discharged two refused to remain in the Home, one was taken away by relatives to be cared for, and the other, who was suffering from dementia, was sent to the Lunatic Asylum in Sierra Leone.

The food supplies have been ample and suitable, and were prepared at the Victoria Hospital.

The two 400-gallon tanks for the storage of water is insufficient, especially as the well water is so brackish; the addition of a couple more tanks at least is necessary.

The sanitation of the Home is well attended to by the Board of Health.

Return of Diseases and Deaths in 1910 in the Victoria Hospital, Bathurst,

Gambia.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	—	—	—
Anæmia	4	—	4
Anthrax	—	—	—
Beriberi	—	—	—
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	5	—	5
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	7	3	7
Enteric Fever	—	—	—
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	6	—	7
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	—	—	—
Kala Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	34	—	34
Tertian	16	—	16
Quartan	4	—	4
Irregular	21	1	21
Type undiagnosed	26	2	26
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	1	—	1
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	—	—	—
Malignant	—	—	—
Old Age	1	1	1
Other Diseases	—	—	—
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	57	1	57
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	1	—	1
Sleeping Sickness	1	1	1
Sloughing Phagedæna	—	—	—
Small-pox	4	—	1
Syphilis	—	—	—
(*a*) Primary	1	—	1
(*b*) Secondary	5	2	5
(*c*) Tertiary	—	—	—
(*d*) Congenital	—	—	—
Tetanus	2	1	2
Trypanosome Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	7	4	7
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	37	—	37
Circulatory System	12	—	12
(*a*) Valvular Disease of Heart	—	—	—
(*b*) Other Diseases	—	—	—
Digestive System—	—	—	—
(*a*) Diarrhœa	8	1	8
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	7	—	7
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	1	1	1
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	3	—	3
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	46	—	56
Ear	1	—	1
Eye	22	—	23
Generative System—	—	—	—
Male Organs	35	—	35
Female Organs	14	—	14
Lymphatic System	19	—	19
Mental Diseases	—	—	—
Nervous System	10	1	10
Nose	—	—	—
Organs of Locomotion	14	—	14
Respiratory System	52	2	53
Skin—	—	—	—
(*a*) Scabies	4	—	4
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	7	—	7
(*f*) Other Diseases	51	—	52
Urinary System	6	—	6
Injuries, General, Local—	75	1	76
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	12	—	12
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea worm)	—	—	—
Tape-worm	—	—	—
Poisons—	3	—	3
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	64	1	64
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

THE PRISON.

The daily average number of prisoners was 23·78 during the year.

The health of the prisoners remained good, and only seven were admitted to the infirmary this year, compared with twenty-one in the previous year. Quinine has been administered to each prisoner regularly every week, and there were only three cases of malaria amongst the prisoners during the past twelve months.

The sanitation of the prison is carefully attended to, and the food and water supplies are of good quality and sufficient.

THE PROTECTORATE.

During the eight months of the dry season, the Protectorate Medical Officer travels from town to town and attends all who come for medical aid, and each year he finds the natives show greater appreciation of his services: 1,002 patients received treatment and twenty-three minor operations were performed.

A little over two years ago a dispensary, with a small ward for three beds, was established at McCarthy Island, some 150 miles up the river from Bathurst. The medical work there is increasing yearly, and it has been considered necessary to make further provision with the view of a resident medical officer being stationed there. During the year a suitable hospital of brick to accommodate two Europeans and ten natives has been built. This will meet a long felt want, and has given great satisfaction to the merchants, who are obliged to maintain factories, with numerous Europeans and native clerks, at points many miles from Bathurst.

METEOROLOGICAL RETURN FOR THE YEAR.—BATHURST.

	Temperatures				Rainfall in inches	Winds. General direction
	Min. on grass	Shade max.	Shade min.	Range		
January	51	93	57	36	75·0	—	East
February	53	101	62	39	86·5	—	North
March	54	100	62	38	81·0	—	,,
April	56	104	62	42	83·0	—	,,
May	60	91	64	27	77·5	—	,,
June	60	95	70	25	82·5	1·15	Variable
July	64	93	70	23	81·5	11·98	,,
August	60	93	62	31	77·5	16·60	,,
September	55	90	60	30	75·0	11·52	,,
October	60	92	79	22	81·0	2·75	,,
November	55	95	68	27	81·5	—	East
December	47	93	62	31	77·5	—	,,
						44·00	

METEOROLOGICAL RETURN FOR THE YEAR.—MCCARTHY ISLAND.

	Temperatures			Mean	Rainfall in inches	Winds. General direction
	Shade max.	Shade min.	Range			
January	101	52	49	76·5	—	N.W.
February	105	55	50	80·0	—	,,
March	110	60	50	85·0	—	,,
April	111	63	48	87·0	—	,,
May	110	61	49	85·5	—	N.
June	108	69	39	88·5	2·88	Variable
July	102	68	34	85·0	9·43	N.
August	91	68	23	79·5	10·72	,,
September	95	68	27	81·5	9·86	,,
October	95	63	32	79·0	2·20	,,
November	98	55	43	76·5	—	Variable
December	99	55	44	77·0	—	,,
					35·09	

Colonial Medical Reports.—No. 23.—Straits Settlements.

MEDICAL REPORT FOR THE YEAR 1911.

By W. GILMORE ELLIS,

Principal Civil Medical Officer, S.S.

THE actual population according to the census taken on March 10, 1911, was 714,069, an increase on the census figures of 1901 of 24·78 per cent. It should, however, be borne in mind that Labuan was not part of the Colony in 1901 and the census of that year did not include Labuan as it did in 1911. This but makes a small difference so far as the rates of increase are concerned owing to the smallness of the additional population.

On comparing the estimated population for the year with the actual census figures it was found that there was an under-estimate of 49,000. This shows that in a population such as that of the Colony the ordinary system of computation in vogue for finding the population of inter-censal years is unreliable. In the circumstances the question arises as to the advantage of having a rough quinquennial census taken without the many abstruse statements which form a special feature of the decennial census. Such an additional census is the more advisable on account of the ever-changing populace of Singapore town, with its large immigration and emigration of adult males not only by large steamships but also by small native craft and by rail.

The number of births registered throughout the Settlements during 1911 was 18,069, as against 18,012 in 1910. This gives a ratio per mille of population of 25·38, as against 27·55 in 1910.

The death-rate for 1911 was 46·46 per mille, as compared with 41·88 in 1910 and 37·40 in 1909. The death-rate for the last ten years gives an average rate of 40·74 per mille of population. The death-rate for 1911 cannot but be regarded as extremely high, more particularly as the taking of the census in this year precludes any possibility of error. A great variation in the monthly death-rates was noticeable. February showed the lowest (31 per mille), June the highest (87 per mille). In this latter month but four short of 4,000 deaths were registered in the Settlements. The weekly rate in Singapore reached 95 per mille for the week ending June 10. The rate, as is usual, began to rise in April, was at its highest in June, July showed the beginning of the fall which continued throughout August. There was a second sharp rise in October which was of short duration. Malaria, for many years past, has headed the list as the cause of the greatest number of deaths. During the epidemic in April, May, June and July, deaths from phthisis, dysentery and beriberi also showed a marked increase, rising and falling week by week, nearly similarly. I cannot explain this.

The weekly average number of deaths from malaria from January 1 to April 30 was in Singapore 41, Penang 17, Malacca 21. The maximum numbers in any one week in the year was, Singapore 127 for the week ending June 10, 1911; Penang 43 for the week ending July 1, 1911; Malacca 74 for the week ending June 10, 1911.

The weekly average death-rate from all causes from January 1 to April 30 was in Singapore 38·47, Penang 34·59, Malacca 53·44. The maximum weekly rate was Singapore 94·54 for the week ending June 10, 1911; Penang 61·58 for the week ending July 22, 1911; Malacca 87·04 for the week ending June 10, 1911.

The influx of sick labourers from outside the Colony is well known as a contributory factor in swelling our death-rate. In addition to the malaria outbreak we have had small-pox practically throughout the year in all Settlements. Cholera also broke out in Singapore and Penang, but these epidemics were in no sense severe. The diseases chiefly affecting our death-rate are dealt with below in detail.

Of the number of deaths registered in 1911, 5,242 deaths were among infants under one year of age, representing a percentage of 15·85 of the total, against 18·47 in 1910 and 19·7 in 1909. The infantile death-rate per mille for 1911, after excluding the births of children born outside the Colony, was 270·47, against 268·93 in 1910 and 263·67 in 1909. Three thousand six hundred and thirty-five deaths were returned as being due to convulsions, this heading probably covering many different causes.

In the hope of lowering this large death-rate among infants, female inspectors have been attached to the Municipal Health Department and visit houses to advise mothers concerning the care of infants. A daily list of births is sent from the Registrar of Births' Office for their information. With a similar hope it is proposed to license native midwives, when a sufficient number have qualified, under a special Ordinance to be framed for the purpose to the exclusion of the present unlicensed and untrained practitioners. Under the scheme for midwives referred to in my report for last year, 6 women were in training during the year, of whom 4 obtained certificates of competency.

Plague.—Of the 35 cases reported all occurred in Singapore Island, 33 being within municipal limits; of these 32 ended fatally.

Cholera.—In Singapore cholera broke out in March, reached its highest in October and had entirely disappeared by the end of the year. Total cases 296, of which 270 ended fatally.

In Penang there were 64 cases, of these 55 ended

fatally. Fifty-seven of these cases occurred on the west side of the island, chiefly inhabited by fishermen. The infection evidently came from Kedah through these fishermen who have dealings with that district.

In Province Wellesley there were 19 cases with 6 deaths. The disease was evidently imported from Penang.

Small-pox.—There were outbreaks of small-pox in all the three Settlements, Malacca showing the largest number of cases, viz., 558, and Province Wellesley next, 357 out of a total of 1,281 cases. In Singapore the cases increased in prevalence up to June with a decrease in the second half-year. In all 241 cases occurred in Singapore with 98 deaths, against 414 with 152 deaths in 1910. In Penang the outbreak was a continuance from 1910. Total 109 cases with 36 deaths, as against 894 with 239 deaths in 1910. In Malacca the disease occurred in various districts at different times. Alor Gajah District was most affected. School teachers were taught how to vaccinate. A fee of 20 cents was paid to them for each successful vaccination. The results were satisfactory, one feature being that the natives who hitherto evaded vaccination willingly came forward to be operated on by fellow-countrymen. In the whole of Malacca 558 cases with 173 deaths were reported.

Diphtheria.—Five cases were treated in the hospitals of the Colony with one death, compared with 8 cases and 3 deaths in 1910. In all 14 cases were notified to the Health Department, compared with 20 in 1910. The total deaths from this cause were 7. All the cases reported occurred in Singapore.

Enteric Fever.—One hundred and seventy-five cases were admitted to the hospitals for treatment, 11 remained from the previous year, giving a total treated of 186. Of these 102 terminated fatally. There were 113 cases with 47 deaths in 1910. The reason for this exceptionally high mortality rate is that the large majority of cases are brought in only in the later stages of the disease and when very dangerously ill, hopelessly so frequently.

Beriberi.—The deaths from beriberi were 2,056, as compared with 1,737 in 1910. The use of cured rice in the different institutions of the Colony has lessened the death-rate from this cause so far as those treated in hospitals are concerned. Although the actual cause of the disease still awaits elucidation, there can be little doubt that the consumption of over-milled rice is a factor in its incidence. This subject is being carefully watched and it may be possible in the future to induce mill owners to somewhat vary their process of milling. The disease is on the increase in Malacca, where the number of deaths from this cause was 443 for 1911, against 267 in 1910 and 219 in 1909. This rise of beriberi in Malacca coincides with the diminishing cultivation of padi, natives there finding it more profitable to work for rubber-planters or to cultivate rubber themselves. At the Beriberi Hospital at Pasir Panjang, Singapore, of 521 cases treated for this disease, but three deaths out of 16 are attributed to beriberi.

Venereal Diseases.—The admissions to all hospitals in 1911 were 2,591 with 40 deaths, as compared with 2,299 with 42 deaths in 1910. These numbers represent but a small proportion of those admitted to hospitals with venereal diseases, a large number being returned under other headings. Several cases of syphilis were treated with salvarsan both intravenously and intra-muscularly; all did well. Lengthy observation of these patients was impracticable owing to the impossibility of inducing Chinese coolies, when once recovered, to return for observation. Wassermann reactions were performed by the Pathological Department at the end of the year for the first time and should prove of material assistance in diagnosis.

Phthisis.—Deaths registered from this cause were 2,907, against 2,571 for 1910 and 2,659 in 1909. Improvement in the death-rate from this disease is hoped to be shown in a few years, when time is given for the sanitary conditions of the bigger towns to improve by the gradual construction of back-lanes, improved drainage, more cubic space, and less overcrowding, more air and sunlight, &c., in tenement dwellings, matters now being taken in hand by the municipalities.

Dysentery.—The deaths from this cause totalled 2,035, the figures for 1910 being 1,392 and for 1909 1,241. A large addition to the water supply of Singapore will soon be completed, improvement to the water supply of other districts is under consideration, and it is trusted that progress on these lines may tend to lessen the incidence of the disease. The number of cases treated in the hospitals show: Remaining, 1910, 62; admitted, 1911, 2,206; total, 2,268; but 4 short of 1,000 of these cases ended fatally, patients so frequently only coming to hospital for treatment when in the last stage of their disease. In 1910 the total treated was 1,643 with 689 deaths. It is astonishing that so many of these patients remain so long alive with but remnants of mucosa in the lower bowel.

Malaria.—There was a widespread and exceptional increase of malaria throughout all Settlements. An increase of this disease has been steady and progressive for several years as shown by the hospital admissions.

An epidemic of the disease commenced towards the end of April, was at its highest in May and June, and steadily fell throughout July and August to our normal rate, a rate though that must be considered far too high. About these same months in Penang and Malacca (not so seriously in the former) similar conditions prevailed. In Malacca places where malaria was formerly little known had several cases of locally contracted disease.

The death-rate from this cause also shows corresponding increase, a conspicuous feature being the number of cases of a malignant type. The deaths from malaria in all Settlements, including Labuan, were 5,821, compared with 3,300 in 1910 and 2,589 in 1909.

The total admissions to hospitals were 11,815 with 1,014 deaths, as against 7,433 with 690 deaths in 1910 and 5,083 with 431 deaths in 1909.

The above photograph is by F. A. Swaine, 106, New Bond Street, from whom copies can be obtained.]

PHOTOGRAPH OF THE TROPICAL SECTION OF THE INTERNATIONAL CONGRESS OF MEDICINE, LONDON, 1913.
Inset, Surgeon-General Sir DAVID BRUCE, C.B., LL.D., F.R.S., R.A.M.C.,
Chairman of the Congress.

Out of 7,173 children examined for enlarged spleen, 854, or nearly 12 per cent., were found affected.

Works are being carried out in this connection. The Municipal Ordinance is being revised *in toto* and sections are to be added dealing with the breeding of mosquitoes, prevention of malaria, &c. In the middle of the year a Malaria Committee was formed in Singapore and a preliminary sum of $20,000 was granted for expenditure upon malaria prevention. A pathologist is being procured from England to relieve Dr. Finlayson, the Government Pathologist, so that the latter officer may be seconded for special duty in this connection, and he will begin work almost immediately with the view of formulating some considered scheme for the stamping out of all anopheline breeding-places within Singapore municipal limits. A start has already been made with one of the worst districts in Singapore; later other portions of the Settlements are to be taken in hand. Throughout the year minor works have been undertaken by the Health Department of all municipalities as well as the clearing of drains and oiling of pools. In Singapore and Malacca all the sanitary inspectors had petty anti-mosquito works included in their daily rounds. In Penang 68 men (daily average) were specially employed on such work. Four thousand nine hundred grains of quinine were distributed gratis in Singapore by the municipality. Five hundred grains were distributed in the schools, an uncertain quantity to coolies and others in Penang and about 4½ lb. were distributed in Malacca. There is no doubt that one of the causes of this large increase in the incidence of malaria is the opening up and clearing of new estates in all parts of the Peninsula with the consequent large influx of coolies whose tendency when ill or unfit for work is to flock into the towns for treatment, bringing the means of disseminating the disease with them.

In Labuan an inspector was appointed by the Sanitary Board and improvement in the general condition of the town is already reported. The Estate Labourers (Protection of Health) Ordinance was passed during the year and a special medical officer was asked for as a preliminary step. I am of opinion, however, that one medical man will not be able to properly supervise the large number of estates in the three Settlements and additional men will no doubt be needed later. This special staff, with a few subordinate officers, will form the nucleus of a Health Department so that eventually an efficient body should exist to deal not only with estates but with village sanitation and all infectious cases occurring outside municipal limits. A considerable amount of work has been done by the municipalities. In Singapore the building of a new Infectious Disease Hospital was started and should be completed next year. A new sewage scheme was adopted for Singapore and will be taken in hand shortly. An up-to-date incinerator at Alexandra Road has been completed. The Kallang reservoir water supply was made available and is an addition of 2½ to 3½ million gallons per day to the town supply. There was further progress with the "back-lanes" and "improvement schemes" and lands are being acquired in several quarters of the town. The Kampong Kapur Scheme was dealt with, low-lying land being filled up and streets and back-lanes laid out. Sultan Ali's estate was also dealt with by improving the buildings and demolishing insanitary areas. The Rochore Canal is to be improved at the joint cost of the Government and municipality. Three dairy farms were started during the year under European management.

In Penang the municipality employed a regular anti-malaria gang of coolies throughout the year. In several localities insanitary houses were demolished. Swampy lands were filled up in places and new streets formed. Many back-lanes were completed and others arranged for. Additional land for the catchment area of the water supply is being gradually acquired.

A Medical Mission was opened in Malacca during the year and is in charge of two lady doctors. Good work has been done by this mission, especially amongst Malay females, who ordinarily reject Western methods of treatment and never come to our hospitals.

Ankylostomiasis.—There were in all 586 cases admitted to hospitals which with the 33 remaining give a total treated of 619. Among these there were 150 deaths. There were doubtless additional cases in the estate hospitals, but no accurate details of these can be obtained. The largest number of admissions (371) were returned by the Malacca hospitals. Under the Estate Labourers Ordinance type latrines are now being insisted upon for all estates.

The first class wards of the General Hospital, Singapore, were frequently full and on several occasions patients had to be treated in second class wards awaiting accommodation. The native wards were often overcrowded so much so in the middle of the year that over 100 patients had to be transferred to the Beriberi Hospital, Pasir Panjang, where a ward was placed at their disposal. These native wards are of antiquated type and the erection of a more up-to-date structure with suitable operating theatre has been proposed and submitted to Government. An electric light and fan installation for Penang General Hospital was completed early in the year. A similar installation for the General Hospital, Singapore, will be completed in 1912.

The admissions to the Tan Tock Seng's Hospital increase yearly, the opening of the Chinese Free Hospital, with some 230 beds, not having diminished the rate. The total treated at Tan Tock Seng's Hospital was in 1909, 8,858; 1910, 9,978; 1911, 13,398.

A special blind ward was erected during the year, the building being the gift of Mr. Ong Kim Wee, of Malacca. This ward has accommodation for fifty and only those incurably blind are admitted.

In Penang the admissions to the District (Pauper) Hospital rose from 3,435 to 3,886. Electric light-

ing was extended to the female District Hospital, a much needed improvement. The Honorary Ophthalmic Surgeon, Dr. Kirk, was in charge of the special eye ward, where 52 out-patients were treated in addition to the in-patients, who numbered 140.

The total admissions to the Malacca Hospitals were 8,559, compared with 4,618 in 1910 and 2,833 in 1909. The existent hospital staff and accommodation in this Settlement will be insufficient if the large increase of patients just noted persists, but it is probable that the exceptionally unhealthy year is the cause of the influx and that a quick return to the normal rate is to be expected. The staff was increased permanently during the year by two dressers and six servants. The rebuilding of Jasin Hospital upon a healthier site is to be undertaken.

The total treated and deaths in the hospitals of the Colony for some of the more important diseases are shown in the subjoined table:—

	Total treated	Deaths
Malaria fever	12,029	1,014
Dysentery	2,268	996
Diarrhœa	1,146	332
Beriberi	2,152	242
Phthisis	1,095	576
Enteric	186	102
Ulcers	4,359	8
Venereal diseases	2,789	40
Ankylostomiasis	619	150

Lunatic Asylum.—The total number treated was 553 patients, 26 less than in 1910. The recovery rate based on the admissions was 36·81 per cent., compared with 40·79 per cent. in the preceding year. The death-rate was 24·30 per cent. on the average daily number resident. Cholera for the second year in succession broke out, on this occasion in the wards at Pasir Panjang, and the patients, including those from the adjoining beriberi wards, were sent to the Quarantine Camp on St. John's Island.

Beriberi Hospital, Pasir Panjang.—One hundred and fourteen patients remained over from 1910, 407 were admitted during the year, making a total treated of 521, all natives. The total treated in 1910 was 437. Some of the wards in this hospital were used as overflow wards for patients from the General Hospital during June, July, and August. Of the sixteen deaths which occurred in this hospital only three were certified as due to beriberi. It is gratifying to note that the marked usefulness of this hospital continues. The change of diet from over milled to parboiled rice is doubtless the main factor, but the daily sea bathing, massage and exercise, insisted upon in nearly all cases, appears to largely benefit the patient and quicken the rate of recovery.

Police Force.—In Singapore there were 5,300 attendances of out-patients, compared with 5,796 in 1910 and 3,924 in 1909. Of the patients 773 were sent to the General Hospital for treatment, 25 being Europeans and 748 natives. The force suffered somewhat severely from malarial fever. Of 189 recruits 147 were passed as fit for service and 42 rejected.

Estates.—The number of estates and consequently the number of labourers have considerably increased. During the year two legislative measures were passed dealing with estates, the Estate Labourers (Protection of Health) Ordinance and the Supervision of Labour Ordinance.

There are as yet only 27 hospitals and dispensaries on estates. The admissions and attendances at these hospitals were ascertained to be about 27,478. A number of type plans for coolie lines, latrines and wells were distributed during the year.

Outdoor Dispensaries.—Twenty-eight thousand seven hundred and eighty-two patients were treated at the eleven outdoor dispensaries of the Colony, against 29,764 in 1910. A change from the old Outdoor Dispensary, Singapore, to the new building in North Canal Road was made on June 17; a decrease in the number of patients attending occurred in consequence, as was to be expected. A second outdoor dispensary for Singapore is to be built, and will be commenced next year.

Vaccination.—Seventy-four thousand five hundred and twenty-five vaccinations were performed during the year, compared with 20,990 in 1910. This large increase was due to the special vaccination called for by the presence of small-pox which, as stated before, was prevalent in the three Settlements. Some of the "Gurus" (Native schoolmasters) in Malacca were instructed in vaccinating and did good work; they were paid 20 cents for each successful case. These men did 8,241 vaccinations, of which 5,522 were successful, and some of the natives otherwise un-get-at-able were thus dealt with. The Vaccination Ordinance needs amendment, as it does not work with sufficient thoroughness. Early attention to this matter is to be given. It is also found difficult to get in correct returns; undoubtedly many vaccinations are never registered. During this, as in past years, a circular was sent to all private practitioners requesting particulars of their vaccination work, but with few exceptions no returns have been made by them.

Quarantine.—The number of passengers and crew examined on arrival in Singapore was 427,409 and 110,882 respectively, against 364,720 and 103,148 in 1910. The disinfecting launch *Hygeia* was in use throughout the year. During the year a regulation (Government Notification No. 1 of January 6, 1911) was passed fixing a scale of charges for the disinfection of ships, the minimum charge being $25. The collections under this notification amounted to $5,017.50. The quarantine station at St. John's Island was occupied throughout the year. A total number of 53,961 contacts were landed, compared with 35,062 in the previous year. The maximum number on any one day was 4,892, taxing the accommodation to its utmost. A new inspection shed was added during the year, as also a new sulphur generator.

Colonial Medical Reports.—No. 23.—Straits Settlements.— *(continued).*

In Penang.—Two hundred and fifteen thousand eight hundred and fifteen passengers and 61,336 crew were examined on arrival during the year, as against 168,216 and 49,751 in 1910, these large increases being mostly due to additional immigration from India, several extra vessels having been put on the run by shipping agents. The new quarantine station at Pulau Jerejak was taken over and occupied on April 6. The old quarantine station was also in occupation throughout the year owing to the unusually large number of immigrant coolies, combined with the occurrence of several outbreaks of cholera, amongst those landed. Extensive structural alterations, especially to latrines, have since been undertaken to suit the class of person usually landed. 134,957 passengers were detained for observation and treatment, against 71,876 in 1910. The largest number on the island on any one day was 11,738 in the old and new combined stations; with better facilities now being carried out for isolating contacts in smaller batches, it is to be hoped such a number will never be reached again.

Government Analyst's Department.—The Department in Singapore was short-handed during nine months of the year on account of officers on leave; a considerable amount of revenue-producing work had to be refused in consequence.

Medical School.—Twenty-two new students entered the school, 16 of whom had passed the Senior Cambridge local examination. Ten students passed out of the school as Licentiates, making a total of 23 men qualified since the opening of the school. At the end of the year 78 students were on the books as studying for the L.M.S., and 24 taking the prescribed course for Hospital assistants. The new library and pathological museum with offices, the gift of the late Mr. Tan Teck Guan, referred to in a previous report, was completed and taken over in June; a brass tablet has been affixed to the building in his memory. The standard of teaching is now on a higher scale than when the school was established, and with the addition of a second assistant to the Principal, to be paid for from the King Edward VII Memorial Fund and a surgical lecturer, both shortly to be appointed, one hopes that improved results will gradually ensue.

Pathological Department.—Two thousand three hundred and thirty-eight autopsies were performed during the year as compared with 1,743 in 1910. On August 19 Dr. Finlayson paid a visit to Kelantan to inquire into a disease called by the natives "Kudis Sabuter," which, it was supposed, had a causal connection with plague. He returned on the 31st idem.

Medical Department, Labuan.—The death and birth-rates were 27·97 and 28·87 respectively. The population at the census 1911 was found to be 6,545, against an estimated population of 8,199 in 1910. There has been a considerable decrease owing to the closing down of the coal mines early in the year. The chief causes of death were fever (57), tuberculosis (23), debility and old age (16), beriberi (10) and dysentery (6). No epidemic disease occurred during the year. Malaria is still prevalent, 118 out of 276 admissions to the Civil Hospital being for this disease. Nine hundred and fifteen out-patients were attended to during the year as against 1,180 in 1910. Two hundred and ninety-six patients were treated in hospital as against 338 in 1910 and 307 in 1909. Seven patients were Europeans.

Miscellaneous.—Forty-three medical practitioners were registered, making a total of 252 names standing on the Register. Of these, 134 are in the service of the Straits or Federated Malay States Governments.

There were seven meetings of the Hospital Board held in Singapore during the year. The Hospital charges to wives and children of Government Medical Officers have been reduced by Government and are now the same as the rates for officers themselves. A Commission was appointed to inquire into the working of the Quarantine and Prevention of Diseases Ordinance in the Settlement of Singapore and commenced sittings on September 11.

Singapore.

GENERAL HOSPITAL.

REPORT BY DR. W. H. FRY, SENIOR MEDICAL OFFICER-IN-CHARGE.

An additional six bedrooms were provided for nurse probationers with a bath and lavatory for same.

Part of the swampy ground at the back of the European block was drained by the Sepoy Lines Golf Club to the great benefit of the hospital.

Twenty mosquito nets on wire frames were provided in the first native ward during the year.

The noises in the vicinity of the hospital still continue, these being most noticeable round the maternity block, sisters' quarters and first-class wards, and arise from the traffic on the road passing between these buildings. I consider this road should be closed by a gate; the constant shouting of hawkers and the passage of 'rikishas, motors and carts interferes considerably with the sleep of the nurses engaged on night duty, and is a source of danger and annoyance to patients in a critical condition. Previous attempts to close this road have failed on account of legal difficulties.

It is to be regretted that the majority of house surgeons arrive with no knowledge of tropical diseases; this, combined with unavoidable ignorance of native languages, forms a serious hindrance to their work and sometimes militates against the satisfactory treatment of patients, time which might profitably be spent in acquiring the latter being devoted to learning the former.

There is an increasing amount of work in this

hospital, and a Supernumerary Medical Officer has been detailed here for duty when available. A third house surgeon is being asked for.

During the year no less than seven sisters and six nurse probationers were admitted to hospital, exclusive of those whose temporary illness was not sufficiently serious to justify their being treated as in-patients; five of the above admissions were due to malaria.

As the total nursing staff is 10 sisters and 13 probationers this represents a very high percentage of sickness, particularly when it is remembered that all the staff are selected for physical fitness and that none of the sisters have been over two years in the Colony.

It is unfortunate that not a single Chinese dresser is available for this hospital; the great bulk of the patients (excluding police) are of Chinese nationality, the dressers without exception being alien in language, ideas, sympathy and nationality to the majority of the patients they are required to attend. Attempt is being made to obtain and train a few.

The senior students of the Medical School have been of considerable assistance, under the direction of the Principal, in the microscopic diagnosis of malarial fevers and other minor laboratory work.

Constant changes took place among the servants of the hospital, fifty-six new servants being taken on during the year. The work, particularly in the native wards, is exacting and the hours often long; many servants merely use the hospital as a training ground.

A large number of the servants were attacked with malarial fever during the year, and 43 were admitted to hospital chiefly for this disease. Preliminary surveys were undertaken towards the end of the year with a view to diminishing the swampy ground in the vicinity of the hospital by drainage and reclamation; one large swamp has been filled in.

During the second and third quarters of the year, when malaria was most prevalent, quinine mixture was served out daily to the menial staff, who were required to drink it in the presence of the steward at the morning roll call.

One death occurred in hospital among the hospital ward boys from Bright's disease.

The use of an efficient Röntgen rays apparatus is badly needed. The existing instrument, which has been in use for several years, is practically useless for diagnostic purposes, while no provision is available for photographic work.

First and Second Class Wards.

The first class wards have been frequently overcrowded during the year, such overflow patients, while awaiting their turn for admission, having to be treated in the "Seamen's" wards.

The chief diseases for which patients sought admission to the first and second class wards were as under, a comparison with the past four years being shown. Patients in these wards, it should be said, include Europeans and better class natives:—

	1911	1910	1909	1908	1907
Malarial fever	239	211	201	111	78
Venereal disease	67	30	55	60	63
Injuries	66	48	44	55	45
Dysentery	34	23	30	27	22
Alcoholism	14	7	13	19	26
Enteric fever	14	9	23	22	23
Phthisis	15	15	11	14	17
Appendicitis	16	8	11	12	4
Liver abscess	6	5	—	7	7

Other diseases of interest were: Blackwater fever, 3, as compared with one case in 1910—two of these cases were Europeans and 1 Chinese, all contracted the disease in Johore, and all had had several previous attacks of malaria; burns, 6; beriberi, 7; cardiac diseases, 11, with 2 deaths; sprue, 2; hepatitis, 7, with 2 deaths; kidney diseases, 9, with 2 deaths; fractured base of skull, 3. No deaths where not so stated.

Dengue claimed 8 admissions in 1911 as compared with 12 in 1910.

The chief causes of death were: Enteric fever, 5; phthisis, 3; dysentery, 3; sub-tertian malaria, tetanus, alcoholism, hepatitis, peritonitis, liver abscess, acute miliary tuberculosis and nephritis, 2 each.

The nationalities of those admitted to the first and second class wards included 521 Europeans, 95 Tamils and other Indians, 69 Eurasians, 33 Japanese, 31 Chinese, 11 Jews and Eurasian Jews, and 7 Malays.

Operations in the first and second class wards numbered 75 under general anæsthesia, numerous minor operations being performed under local anæsthetics.

The chief operations comprised: Liver abscess with excision of ribs, 6; operations on rectum, 9; amputations, 3; removal of glands, 6; appendicectomy, 2; and ligature of thyroid, tracheotomy, ruptured urethra, laparotomy, radical cure of hernia and mastoid operation, 1 each.

Malarial fever admissions show a higher number than in any previous year, the increase during the past years being continuous and persistent. A great proportion of these were of the sub-tertian variety.

Several of the patients admitted to the first class wards with malaria were engaged in planting in Johore, Negri Sembilan and Malacca.

Venereal disease admissions are higher than during past years, and more than double the number admitted in 1910. The numbers shown, moreover, represent but a small proportion of those admitted with this complaint, many cases being returned under rheumatism, arthritis and other diseases of a venereal origin.

A few patients were treated with salvarsan injection, some intramuscularly, others intravenously. All did well, though lengthy observation of the patients was impracticable owing to their leaving hospital shortly after the injection.

Wassermann reactions were performed by the Pathological Department at the end of the year for the first time, and should prove of material assistance in the diagnosis of venereal disease.

INTERNATIONAL TRIBUTE TO SIR PATRICK MANSON, G.C.M.G., F.R.S., LL.D., M.D.

Obverse and reverse of medal devised by Professor Paul Richer, of Paris. The medal was presented to Sir Patrick in the name of subscribers by Professor Blanchard, of Paris, on August 11, 1913, on the occasion of the International Medical Congress, at a large gathering of the Section of Tropical Medicine.

RETURN OF DISEASES AND DEATHS IN 1911 AT THE FOLLOWING INSTITUTIONS:—

General Hospital; Prison, St. John's Island; Tan Tock Seng's Hospital; Quarantine Camp; Leper, Beriberi and Lock Hospitals; and Lunatic Asylum, Singapore, Straits Settlements.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	43	3	43
Anæmia	146	17	153
Anthrax	—	—	—
Beriberi	828	103	981
Bilharziosis	—	—	—
Blackwater Fever	4	1	4
Chicken-pox	68	—	69
Cholera	479	340	479
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	18	1	18
Diabetes Mellitus	5	1	5
Diabetes Insipidus	—	—	—
Diphtheria	5	1	5
Dysentery	1,206	567	1,249
Enteric Fever	160	94	170
Erysipelas	8	—	8
Febricula	487	3	487
Filariasis	—	—	—
Gonorrhœa	211	—	222
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	—	—	—
Kala Azar	—	—	—
Leprosy	58	18	95
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	354	29	355
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	2,491	377	2,575
Quartan	8	—	13
Irregular	8	—	8
Type undiagnosed	3,849	172	3,865
(*b*) Remittent	—	—	—
(*c*) Pernicious	453	34	470
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	35	—	35
Mumps	26	—	26
New Growths—	—	—	—
Non-malignant	15	—	15
Malignant	2	1	2
Old Age	33	15	33
Other Diseases	507	187	525
Pellagra	—	—	—
Plague	21	15	21
Pyæmia	16	13	16
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	199	—	205
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	16	15	17
Sleeping Sickness	—	—	—
Sloughing Phagedæna	7	1	7
Small-pox	303	75	312
Syphilis	—	—	—
(*a*) Primary	341	—	365
(*b*) Secondary	656	31	730
(*c*) Tertiary	15	—	19
(*d*) Congenital	—	—	—
Tetanus	14	9	11
Trypanosome Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	122	73	139
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	2	—	2
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	330	24	374
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	90	37	97
(*b*) Other Diseases	47	25	54
Digestive System—	—	—	—
(*a*) Diarrhœa	274	9	288
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	9	1	9
Congestion of Liver	9	—	9
(*d*) Abscess of Liver	30	14	30
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	4	1	4
(*g*) Cirrhosis of Liver	102	43	102
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	3	1	3
(*j*) Other Diseases	758	117	804
Ear	11	—	11
Eye	427	—	499
Generative System—	—	—	—
Male Organs	262	6	269
Female Organs	302	10	310
Lymphatic System	309	19	316
Mental Diseases	326	88	655
Nervous System	324	81	370
Nose	9	—	10
Organs of Locomotion	329	12	360
Respiratory System	865	353	904
Skin—	—	—	—
(*a*) Scabies	48	—	48
(*b*) Ringworm	2	—	3
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	104	—	108
(*f*) Other Diseases	1,899	6	1,900
Urinary System	244	71	255
Injuries, General, Local—	1,558	59	1,558
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	41	10	41
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	61	30	68
Filaria medinensis (Guinea worm)	3	—	3
Tape-worm	—	—	—
Poisons—	28	7	28
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	1,085	—	1,085
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	4	—	4
(*b*) Iridectomy	1	—	1
(*c*) Other Eye Operations	14	—	14

Dysentery and appendicitis show a marked increase over previous years.

The admissions for phthisis remain fairly constant.

Native Wards.

These wards were greatly overcrowded during the months of April, May, June and July. The maximum number on any one day was 233 on June 13, the full number of beds available in the general ward being 160 without overcrowding.

Owing to this overcrowding 147 cases of various diseases in convalescent stages were at different times transferred to the Beriberi Hospital, Pasir Panjang.

The chief diseases treated with a comparison of former years are as under (the numbers including all native ward patients, whether police or otherwise):—

	1911	1910	1909	1908	1907
Malarial fever	1,616	1,117	736	858	619
Injuries	865	889	768	809	448
Venereal disease	278	371	246	284	215
Dysentery	149	119	130	158	123
Enteric fever	76	42	69	101	145
Beriberi	68	90	80	126	68
Tuberculosis	43	86	108	91	70
Pneumonia	33	—	54	23	22
Cholera	13	—	5	2	5
Plague	7	—	2	—	—
Small-pox	2	7	—	1	—

Other cases included heart disease, 30, with 11 deaths; Bright's disease, 20, with 2 deaths; ankylostomiasis, 23, with 3 deaths; meningitis, 11, with 8 deaths; myelitis, 2, both fatal; fractured base of skull, 10, with 6 deaths; ruptured spleen, 7, all fatal; liver abscess, 5, with 3 deaths; cut throat, 3, with no deaths; ruptured bladder, 2, with 1 death; and hare lip, 1.

The chief causes of death were: Malaria, 111; injuries, 42; enteric, 42; dysentery, 66; pneumonia, 20; beriberi, 23; phthisis, 24; peritonitis, 13; broncho-pneumonia, 12; empyema, 8; tetanus, 7; and cholera, 6.

As regards malarial fever, it will be noticed from the above table that the increase in the number of cases has been steady and progressive. In 1906 the number of patients treated was 401, and in 1905, 369.

This disease has considerably swollen the number of deaths during the year, and frequently caused serious overcrowding of the wards from the number of cases admitted. Of the total number of deaths in the native wards 23 per cent. were caused by malaria, compared with a percentage of 11·20 from this disease last year.

It has been obvious also from the autopsies performed that a large number of those dying from other complaints had had their constitutions enfeebled and health wrecked by previous or existing malarial fever.

From records kept during such periods as malaria was most prevalent, it was found that very few of the admissions for this year were those of persons residing outside municipal limits.

In all wards blood films were taken on admission of all suspected malarial fever cases, a feature of the microscopic examination of the blood of these patients being the large number in which sub-tertian or malignant parasites were found, these exceeding all other varieties.

It has been a matter of general comment that the number of mosquitoes in the vicinity of the hospital has greatly exceeded the numbers met with in previous years. This was particularly noticed during the second and third quarters of the year.

To all natives, irrespective of race, parboiled rice only was issued, save in a few rare instances, when Siam rice was supplied as an extra to non-beriberi patients.

Native Police.

Seven hundred and forty-eight police were admitted, as compared with 648 in 1910 and 529 in 1909.

The chief diseases treated were; Malarial fever, venereal disease, no disease discoverable and malingering, ulcers and boot-bite, bronchitis, dysentery, synovitis, conjunctivitis, phthisis.

Eight deaths occurred among the police: Malaria, 4; dysentery, 2; and anæmia and pernicious anæmia, 1 each.

The admissions for malarial fever were largely in excess of previous years, 219 being admitted in 1910, and 193 in 1909.

The chief nationalities of those admitted were Sikhs, 297; Tamils and other Indians, 225; Malays, 164; and Chinese, 62.

Maternity Wards.

The total admissions were 233 as compared with 199 last year, 173 in 1909, and 143 in 1908.

The nationalities of those admitted included: Europeans, 60; Eurasians, 12; Chinese, 61; Tamils, 30; Japanese, 14; Sikhs, 12; Eurasian Jews, 9; Malays and Javanese, 8.

A number of the European patients admitted came from Malacca and the Federated Malay States; the remainder were from Singapore Island.

The deliveries comprised 59 European infants, being 33 males and 26 females; the native infants were 58 males and 84 females.

The average weight of the European infants was 7 lb. 4½ oz.; that of the native infants 6½ lb.

Two European infants and 19 native infants were stillborn.

There were no deaths among European mothers, but 5 among native women. These were 1 within twenty minutes of admission from cardiac failure, 1 each from dysentery, placenta prævia, and rupture of the broad ligament, and 1 shortly after admission undelivered.

Colonial Medical Reports.—No. 23.—Straits Settlements—(*continued*).

REPORT ON THE HEALTH OF THE POLICE FORCE IN SINGAPORE FOR 1911.

REPORT BY DR. W. S. SHEPPARD, POLICE SURGEON.

There were 5,300 attendances at the out-patient room during the year as compared with 5,796 in 1910, and 3,924 in 1909.

There are some constables who hardly ever let a week pass without reporting sick, however trifling their ailment may be, and it is partly on this account that the number of attendances recorded is so large.

The majority of these attending the sick-room are men suffering from slight indisposition or perhaps in some cases merely from ergophobia.

Seven hundred and seventy-three cases were admitted to the General Hospital. Of these 25 were Europeans and 748 were natives.

There were 8 deaths. The number of malarial and other fever cases is the highest ever recorded.

PRISON HOSPITAL.

REPORT BY DR. W. S. SHEPPARD, MEDICAL OFFICER.

There were 1,041 admissions to hospital, the daily average of sick being 50·7, against 1,061 and 47·05 respectively in 1910.

The health of the prisoners has not been satisfactory, owing chiefly to the prevalence of three disorders, viz., colitis, eczema and neuritis.

Colitis (with which I group dysentery and some cases of intractable diarrhœa) is an old scourge. In 1911, 261 cases were recorded as compared with 315 cases in 1910, and 278 in 1909.

The careful supervision of the food and water supply would seem to leave no loophole for the entrance of these disorders. Nevertheless, they recur year after year. Many cases are undoubtedly relapses.

Eczema scrotum is a trifling malady in itself, but it causes discomfort and incapacity for the hardest kind of work. The cause is probably imperfect personal cleanliness, this in turn being due to too short a time being allotted to the bathing of the prisoners and, in some instances, perhaps, to insufficient cleansing of infected clothing. Better care is now taken in both these matters.

Neuritis has probably been prevalent in the gaol for some years past, but it has escaped detection. During the year my attention was directed to it, and I was able to compile a list of 75 cases; all were affected but slightly. The lower extremities are the parts commonly affected. Experiments conducted at the Kuala Lumpur Research Institute and at the Singapore Prison tend to show that parboiled rice when cooked under a 40-50 lb. steam pressure in a closed vessel is not protective against beriberi and neuritis—as was once believed.

Patients suffering from neuritis are, therefore, now fed on rice cooked in an open pan, and the other prisoners on rice cooked in steamers with an air inlet.

Beriberi.—Six cases occurred, 4 in long sentence prisoners, 1 in a short sentence prisoner, and the sixth case was admitted to prison with the disease. The long sentence prisoners undoubtedly contracted the disease in the prison. There were no deaths.

The percentage of deaths to total treated was 3·8, and to the total prison population 0·63. Besides these deaths in hospital 3 occurred in long sentence prisoners, who died suddenly in their cells, the cause of death being heart failure from disease of the heart.

TAN TOCK SENG'S HOSPITAL.

REPORT BY DR. T. D. KENNEDY, ACTING MEDICAL OFFICER.

The average daily sick was 608·81, against 519·77 in 1910.

The average stay in hospital of the total treated was 16·59 days, while that of those who died was 11·57, of those who were discharged 13·30, and of those remaining at the end of the year 90·78.

The percentage of deaths to total treated was 14·33, against 15·71 in 1910.

There were 1,920 deaths. Of this number no less than 337 died within twenty-four hours of admission, and 145 within forty-hours. Eliminating those dying within twenty-four hours, the death-rate would be 12·12 instead of 14·33, and eliminating those dying within forty-eight hours 10·73.

The admissions have been the largest number on record—12,826—being an increase over the previous year of 3,924. Notwithstanding the opening of the Kwong-Wai-Shiu Free Hospital, where the patients average daily about 200, there has been no falling off in the numbers seeking admission here.

The principal diseases treated were: Malaria, ulcers, venereal diseases, dysentery, beriberi, phthisis, injuries, abscess, pneumonia, bubo, Bright's disease, rheumatism, scabies, bronchitis, hepatic cirrhosis, enteritis, enteric fever, ankylostomiasis and corneal ulcer.

Malaria.—Among the diseases treated malaria again formed the bulk of the admissions; the number of cases being 5,022 with 476 deaths, against 3,150 cases and 377 deaths in 1910, and 1,922 and 260 deaths in 1909.

The localities from which malaria cases came were chiefly Johore, Bukit Timah, Tanjong Pagar, Kampong Malacca, Upper Serangoon, Kampong Kapur and Thomson Road.

Ulcers.—There were 1,719 cases of ulcer, against 770 in 1910. Two wards are devoted solely to the treatment of ulcers and they are not enough. There are many cases distributed throughout the other wards. The wastage from this simple cause is lamentable. From ignorance and neglect on the part of the patient, he frequently seeks admission to hospital so late that the only means of saving life is amputation of a limb.

Venereal Diseases.—They were made up as follows: Primary and secondary syphilis, 889; gonorrhœal and syphilitic arthritis, 222; gonorrhœa, 100. There were 26 deaths from secondary syphilis and 3 from arthritis.

A few cases of syphilis, specially selected, were treated for the first time with "606" with excellent results. Thirty were treated by intramuscular injection, and 20 by intravenous.

Dysentery.—The total number of cases treated was 900, as compared with 642 in 1910; of these 444 died, giving a mortality of 48·4 per cent., against 52·49 per cent. in 1910. As in former years this high percentage is largely due to the hopeless condition of patients when they are admitted to hospital. Thirty-one died within twenty-four hours of admission to hospital.

Beriberi.—Four hundred and eighty-five patients were treated, 66 died, a mortality of 13·5 per cent. Of these 66, 36 died with twenty-four hours of admission, reducing the death-rate to 6·18. This shows a gratifying decrease from the previous year, when 590 cases were recorded, with a mortality of 19·67 per cent. One hundred and ninety-seven chronic cases were transferred to the Beriberi Hospital at Pasir Panjang.

Pulmonary Tuberculosis.—Grouped under phthisis were 385 cases, of these 215 died, giving a death-rate of 55·84. Under general tuberculosis were 74 cases with 36 deaths.

Pneumonia.—One hundred and sixty-nine cases were treated with 81 deaths, and 22 cases of broncho-pneumonia with 18 deaths.

Enteric Fever.—Sixty-two cases with 36 deaths.

Ankylostomiasis.—Sixty-seven cases with 29 deaths, 7 of these died with twenty-four hours of admission.

Lunacy.—One hundred and thirty-seven patients were sent for observation, of whom 87 were certified as insane and transferred to the Lunatic Asylum.

Medico-legal.—Seventy-two bodies were sent for Coroner's inquest, in addition there were the usual inquests on those who died in hospital from accidents and injuries. Five hundred and thirteen police cases were sent in for treatment.

The total number treated in the European ward was 420, with 14 deaths from the following causes: Enteric fever, 2; cerebral hæmorrhage, 2; liver abscess, 2; malaria, 1; beriberi, 1; phthisis, 1; cystitis, 1; blackwater fever, 1; sprue, 1; diabetic coma, 1; senility, 1. The diseases were chiefly malaria, venereal diseases, alcoholism, phthisis and bowel complaints.

The surgical work done during the year has been greatly in excess of that done in any former year.

Cholera.—One hundred and two cases were admitted during the year. There were 71 deaths, giving a mortality of 69·6 per cent. During the latter part of September to the end of October there was an outbreak of cholera, when 65 cases were admitted. Forty patients died, giving 38 per cent. recoveries. Roger's treatment by intravenous injection of hypertonic saline was tried for the first time and gave encouraging results. Forty-six cases were injected one or more times and 27 of them recovered. The percentage of recoveries of those injected was 58 per cent.; of 19 uninjected only 2 recovered, a percentage of 10 recoveries.

Plague.—Eleven patients were admitted, of whom 5 died, giving a mortality of 45·45 per cent. In bubonic cases secured in the early stages of the disease, free incision or the enucleation of the enlarged glands favourably influenced the future course of the disease.

Small-pox.—The number of cases treated was 231. Of these 65 died, giving a death-rate of 28·13 per cent. Of 124 with evidence of past vaccination but 14 died compared with 51 deaths occurring in 101 unvaccinated cases.

LUNATIC ASYLUM.

Report by Dr. H. J. Gibbs, Medical Superintendent.

One hundred and ninety males and 30 females were admitted in 1911, making a total treated for the year of 452 males and 101 females.

Of the above 13 males and 1 female were second admissions.

The recovery and death-rates on the total treated for 1911 were 14·65 and 15·75 respectively. The death-rate for 1911, based on the average number resident, was 24·30 per cent. Cholera, dysentery and tuberculosis are largely answerable for this high rate. The recovery rate calculated on the admissions was 36·81 per cent.

The number of deaths occurring in those with under a month's residence indicates the greatly impaired physical condition of many of the patients on admission.

Amongst the main causes assigned malaria again ranks highest with 62, thus contributing 28·18 per cent. of the admissions as against 14·04 of the previous year. The Asylum shared with the rest of the town and country in the epidemic. So bad was it here that but few of the staff escaped. At one time both dressers, the steward, clerk and the matron were seriously ill with the disease. Of the many patients who suffered 9 died.

Venereal disease is assigned as the cause of 21 cases of mental breakdown, it is doubtful if these figures are correct in more than 3 per cent. of the cases.

Alcohol, pulmonary tuberculosis, previous attacks, old age and hereditary influences yielded, respectively, 17, 16, 17, 9 and 7 cases.

Alcohol, as a factor in the causation of insanity, shows a slightly higher rate than it did for 1910.

Beriberi.—One patient was admitted in August with the disease from Singapore, otherwise the Asylum has remained free. The experiment of feeding the patients with under-milled Siam rice commenced on December 21, 1910, was continued with two or three short breaks from want of such rice until November 30, 1911, when it had to be abandoned owing to the Government of Siam refusing to export any on account of the rice famine. During the period the patients were so fed no beriberi occurred.

Cholera.—I regret to have to again record an outbreak of this disease amongst the patients at

Pasir Panjang Asylum. The first case occurred on August 17. Three days after the commencement of the outbreak all patients were removed to the Quarantine Station on St. John's Island.

There were no cases amongst the beriberi patients in the adjoining wards at first, but within three days the disease also broke out there and the patients were removed to St. John's on August 23.

During their stay on the Quarantine Station 11 deaths from cholera occurred amongst the insane, 2 amongst the beriberi patients, and 1 hospital servant, a toty, died.

One of the Bengali attendants was also attacked with cholera on St. John's; he recovered.

It is difficult to account for this outbreak at Pasir Panjang, five miles from town, although cases of cholera were being reported in Singapore at the time.

A few days before the outbreak the municipal water supply was noticed to be offensive and dirty, the water having become stagnant. Arrangements were at once made for the more frequent flushing of the main. It is hardly probable that this water was in fault or a far bigger and more general outbreak must have occurred.

An interesting case to note is that of a malarial patient with an enlarged and diseased spleen, who ruptured his spleen by violent vomiting and died within two hours.

BERIBERI HOSPITAL, SINGAPORE.

REPORT BY DR. H. J. GIBBS, PHYSICIAN-IN-CHARGE.

Four hundred and seven patients were admitted in 1911, a total treated of 521 during the year. Of these, 94 were discharged recovered, 184 relieved, 1 not improved, 9 were transferred to the General and Tan Tock Seng's Hospitals for diseases other than beriberi, 120 absconded and 16 died, leaving under treatment at the end of 1911, 97 patients.

Owing to the occurrence of cholera amongst the neighbouring male and female insane patients on August 19 and of a case on August 22 amongst the Tan Tock Seng's Hospital beriberi patients the whole of the General Hospital overflow patients then in residence were, with the beriberi patients, removed to the Quarantine Station on St. John's Island on August 23.

During their period of quarantine two fatal cases of cholera occurred among the General Hospital patients, the first on the 23rd and the second on the 31st August, they both died on the 31st.

Of the beriberi patients the patient attacked on the 22nd died on the 23rd, and at St. John's one other was attacked but recovered.

I regret to have to report the death of the toty of the Beriberi Hospital from cholera. He became infected while in attendance on the patients on August 29 and died the following day.

PENANG.

REPORT BY DR. R. DANE, SENIOR MEDICAL OFFICER.

"Settlement" includes Penang, Province Wellesley and Dindings.

The estimated mean population of the Settlement for 1911 was 278,811 (Penang Island, 141,893; Province Wellesley, 129,340; Dindings, 7,578).

Births.—The births in the Settlement during 1911 were 7,358. This is an increase of 481 on 1910. Penang Island, 3,371; Province Wellesley, 3,789; Dindings, 198.

Deaths.—The number of deaths in the Settlement in 1911 was 10,231 (6,973 males, 3,258 females) which shows an increase on 1910 of 713.

The death-rate of Penang Island alone was 41·46, an increase of 3·36 per mille on 1910.

Beriberi.—Parboiled rice is exclusively used in all Government institutions and in them no fresh cases have occurred.

Malarial Fever.—What I found at Glugor Village is typical of some other places. Over an area of about half a square mile there are streams, ditches, big puddles, tiny puddles, small ponds and hoof prints. To level and drain this area would cost a large sum, besides a large amount annually to keep it in order.

My recommendations for treatment now are:—

(1) The distribution of tabloids of quinine at cost price. Tabloids; because the peasant, and others too, will not take the bitter solution, or the powder; and at cost price because what is given free is not valued, and because if given free it would be cornered by some rogues.

(2) Instruction of the boys at school to recognize mosquito larvæ; ocular demonstration that these larvæ become mosquitoes. I think it likely that the rising generation may thus be induced to help themselves to kill off the mosquito larvæ.

(3) A labour party, under direction of the Senior Medical Officer, to go round, under control of a sanitary inspector.

General Diseases.—The admissions to the various hospitals in the Settlement were 12,873, against 10,368 in 1910.

Small-pox.—The 1910 outbreak in Penang continued up to October, 1911; 109 cases and 32 deaths. The 1910 outbreak, Province Wellesley, continued up to the end of 1911; 357 cases with 78 deaths. Dindings began in March and ended in July; 14 cases with one death.

Cholera.—An outbreak occurred on the west side of Penang Island. There were 60 cases and 52 deaths. A special report has been sent in.

The question of enlarging the accommodation for Europeans at the General Hospital has been under consideration since October. On several occasions there was no room in the seamen's ward and some patients were temporarily put into the officers' ward. Besides, admissions had to be refused on several occasions.

The new Quarantine Station was opened on April 6. Latrines had been provided which if properly used would have been ideal. Experience showed that the Tamil coolie would not and could not use them properly, as a consequence the camp became insanitary. These facts not being known publicly false conclusions were drawn.

RETURN OF DISEASES AND DEATHS IN 1911 AT THE FOLLOWING INSTITUTIONS:—

General, District, Lock, Prison, Quarantine Camp, Jelutong, Balik Pulau, Leper Hospital, Pulau Jerejak, Lumut, Female Leper Ward, Jelutong, and Female Ward, District Hospital and New Quarantine Station, Pulau Jerejak, Penang, Straits Settlements.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	45	—	46
Anæmia	649	87	659
Anthrax	—	—	—
Beriberi	134	40	170
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	65	—	75
Cholera	270	204	270
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	250	1	250
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	1	—	1
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	421	174	426
Enteric Fever	6	2	7
Erysipelas	3	1	3
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	148	—	150
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	—	—	—
Kala Azar	—	—	—
Leprosy	221	159	624
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	634	59	639
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	527	47	542
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	254	25	269
Malta Fever	—	—	—
Measles	31	—	31
Mumps	13	—	13
New Growths—	—	—	—
Non-malignant	10	—	10
Malignant	13	4	14
Old Age	29	5	29
Other Diseases	188	33	201
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	189	1	208
Rheumatoid Arthritis	1	—	1
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	3	3	3
Sleeping Sickness	—	—	—
Sloughing Phagedæna	17	15	20
Small-pox	124	21	175
Syphilis	—	—	—
(*a*) Primary	55	—	58
(*b*) Secondary	384	6	428
(*c*) Tertiary	25	3	27
(*d*) Congenital	—	—	—
Tetanus	5	4	5
Trypanosome Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	5	3	6
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—

GENERAL DISEASES—*continued.*	Admissions	Deaths	Total Cases Treated
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

Diseases of the—			
Cellular Tissue	192	4	214
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	83	31	84
(*b*) Other Diseases	29	2	29
Digestive System—	—	—	—
(*a*) Diarrhœa	455	150	477
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	1	—	1
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	5	3	5
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	3	—	3
(*g*) Cirrhosis of Liver	18	6	19
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	2	1	2
(*j*) Other Diseases	409	18	413
Ear	11	—	11
Eye	190	—	216
Generative System—	—	—	—
Male Organs	297	—	311
Female Organs	191	-	195
Lymphatic System	163	—	179
Mental Diseases	—	—	—
Nervous System	118	34	135
Nose	7	—	7
Organs of Locomotion	80	2	92
Respiratory System	430	137	472
Skin—	—	—	—
(*a*) Scabies	125	—	128
(*b*) Ringworm	23	—	25
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	35	—	36
(*f*) Other Diseases	1,077	4	1,125
Urinary System	161	49	165
Injuries, General, Local—	484	14	500
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	—	—	—
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	27	6	28
Filaria medinensis (Guinea worm)	3	—	4
Tape-worm	2	—	2
Poisons—	—	—	—
Snake-bites	1	—	1
Corrosive Acids	—	—	—
Metallic Poisons	1	—	1
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	1	—	1
Surgical Operations—	201	—	201
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

Colonial Medical Reports.—No. 23.—Straits Settlements— (*continued*).

QUARANTINE CAMP.

REPORT BY DR. R. DANE, SENIOR MEDICAL OFFICER.

Of infectious diseases there were 61 cases remaining at the beginning of the year (*viz.*, small-pox 51 and chicken-pox 10) and 150 were admitted during the year.

Three hundred and eleven contacts and 87 observation cases were admitted. Of them 90 were vaccinated for the first time on arrival in the camp, 113 had vaccination marks but were re-vaccinated. Ninety-five having been recently vaccinated and 13 having obvious marks of previous small-pox were not vaccinated.

Nineteen cases of small-pox died during the year, 17 of whom bore no vaccination marks. The two cases who acquired small-pox in the camp and died were vaccinated on admission to the camp. They were both infants. They had been in contact with small-pox some days before admission.

Eleven deaths occurred amongst patients admitted for observation, *viz.*, acute dysentery, 2; acute diarrhœa, 7; chronic diarrhœa, 1; acute cholecystitis, 1.

GENERAL HOSPITAL.

REPORT BY DR. J. S. WEBSTER, SURGEON-IN-CHARGE.

During the year 1911 there have been 276 patients admitted to the European wards and 1,593 to the native wards as compared with 271 and 1,227, respectively, during 1910. This shows an increase of 371 patients, *i.e.*, 24·7 per cent. The mortality excluding deaths within 24 hours of admission was 2·82 for the European wards and 8·07 for the native wards, as compared with 2·95 for the Europeans and 4·22 for the natives in the former year. The cause of this increase in the number of deaths occurring in the native wards is easily found in the number of Tamil coolies who have been admitted to hospital in a moribund condition.

On several occasions all the beds in the European wards have been occupied and patients have either had to be refused admission, or else others, only partially recovered, discharged to make room for them.

The principal diseases treated: Malaria, 399 with 18 deaths; tuberculosis, 23 with 8 deaths; dysentery, 84 with 30 deaths; venereal, 102 with no deaths; beriberi, 15 with 5 deaths.

Beriberi.—Fifteen cases were treated during the year, as compared with 25 in 1910 and 15 in 1909. No case occurred amongst patients admitted to hospital for other diseases.

Operations.—One hundred and thirty-three operations were performed during the year as compared with 108 in 1910.

PRISON HOSPITAL.

REPORT BY DR. R. DANE, SENIOR MEDICAL OFFICER.

The sanitary condition of the prison was good, and the health of the prisoners satisfactory.

Six hundred and fifteen patients were admitted during the year. The average daily sick was 31·15. The prominent diseases causing admission were: Diarrhœa, 101; anæmia, 40; dysentery, 28; phthisis, 13.

Mortality.—Of the 25 deaths 20 were certainly due to disease acquired before arrival in prison, 15 of them being sent straight into hospital.

From October to the end of the year I arranged with the Superintendent of Prisons that all prisoners should be kept in their cells for the first twenty-four hours after admission so that we could discover any who were suffering with diarrhœa or dysentery on arrival. Since this has been done a large number of cases of diarrhœa has been so detected.

DISTRICT HOSPITAL.

REPORT BY DR. J. S. WEBSTER, MEDICAL OFFICER.

3,886 patients were admitted during the year as against 3,485 in the previous year.

The average daily sick was 331·13 as compared with 289·73 in 1910.

There were 516 deaths during the year (mortality 13·30 to total treated) as against 527 deaths in the previous year (mortality 14·05). Forty-five patients died within 48 hours of admission. The percentage of deaths to total treated, excluding those dying within 48 hours of admission, was 11·35.

Operations.—Sixty-three operations were performed during the year, nearly all of a minor nature.

Malarial Fever shows an increase over those admitted in the three preceding years. Beriberi shows a marked decrease of cases treated. No cases occurred amongst patients in hospital. Parboiled rice was exclusively used in the hospital as in recent years.

Dysentery.—One hundred and seventy-nine cases were treated during the year with 77 deaths (mortality 43·02).

Diarrhœa.—Acute and chronic accounted for 232 cases treated with 91 deaths (mortality 39·22).

The high mortality among diarrhœa and dysentery cases is accounted for by the fact that most of the cases when brought in were in a practically moribund condition.

Phthisis also shows a high death-rate as in previous years. There was a slight falling off in the number of admissions.

Venereal Diseases accounted for 613 admissions with 6 deaths.

EYE WARD, DISTRICT HOSPITAL, PENANG.

REPORT BY DR. J. KIRK, HONORARY VISITING OPHTHALMIC SURGEON.

There were 140 cases of eye disease treated in this ward during the year as in-patients and 52 attended as out-patients.

There were also 20 cases of subconjunctival injection performed. This method of treatment has had encouraging results in many cases of pannus and corneal opacity.

BALIK PULAU HOSPITAL.

REPORT BY DR. R. DANE, SENIOR MEDICAL OFFICER.

During the year 328 patients were admitted. The daily average number of sick was 36.

The principal diseases were: Ulcers, 119; malarial fever, 39; injuries, 20; rheumatism, 16; anæmia, 14; diarrhœa, 12; phthisis, 11; chancroids, 13; syphilis, 10.

There were 39 deaths during the year, giving a mortality of 10·86 of those treated. The causes of death were: Phagedæna, 6; phthisis, 6; diarrhœa, 6; chronic Bright's disease, 5; dysentery, 3; anæmia, 3; valvular disease of the heart, 3; malaria, 2; pneumonia, 1; septicæmia, 1; syphilis, 1; cellulitis, 1; enteritis, 1.

There was an outbreak of cholera—60 cases occurred with 52 deaths, the first case was reported on May 4, and the last case on May 28.

LUMUT HOSPITAL, DINDINGS.

REPORT BY DR. R. DANE, SENIOR MEDICAL OFFICER.

Four hundred and seventy-seven cases were admitted during the year, 12 remained from the previous year, making a total of 489 cases treated. The principal disease treated was malarial fever 178 (104 cases from Sitiawan and 74 cases from the District of Dindings). The average daily sick was 13.

There were 56 deaths during the year, of this number 19 died within 48 hours of admission. The causes of death in the 56 fatal cases are: Malaria, 12; anæmia, 12; dysentery, 10; beriberi, 5; phagedæna, 3; phthisis, 3; acute nephritis, 2; debility, 2; chronic malaria, 1; tuberculosis, 1; chronic bronchitis, 1; broncho-pneumonia, 1; enteritis, 1; abscess of the liver, 1; and Bright's disease, 1. The percentage of deaths to total treated was 11·45. The percentage to total treated, excluding those dying within 48 hours of admission, was 7·87.

Fourteen cases of small-pox occurred in the district with 1 death.

The general health of the population in Lumut has been satisfactory.

LEPER ASYLUM, PULAU JEREJAK.

REPORT BY DR. J. C. C. FORD, MEDICAL OFFICER-IN-CHARGE.

The average daily number of inmates was 412. The percentage of deaths was 26·12. One Chinese leper (Perak) committed suicide by hanging.

Official visits were made during the year by His Excellency the Governor; the Honourable Resident Councillor, Penang; the Honourable Principal Civil Medical Officer, S.S.; the Honourable Colonial Engineer. Other visitors were the Bishop of Malacca and Dr. R. Romer, of Deli (Sumatra).

Towkays Goh Taik Chee and Goh Soon Cheng presented each leper with a small sum of money at the Chinese New Year; this amount was supplemented by a donation from the Anti-Mendicity Fund.

FEMALE DISTRICT HOSPITAL.

REPORT BY DR. J. S. WEBSTER, MEDICAL OFFICER.

Throughout the year all the patients in this hospital have been lodged in a ward on the lower story of the Female Ward. It is proposed to cement the floor of this ward during the coming year since many of the patients have very filthy habits. New latrines were erected for this ward, together with two new bathrooms, and they are connected with the building by means of a covered way. Electric light has also been installed; it is a great improvement.

During the year there have been 247 admissions with 52 deaths. Many patients arrived in a moribund condition. The patients have consisted almost entirely of Tamils and Chinese, especially the former.

PROVINCE WELLESLEY.

REPORT BY DR. E. D. WHITTLE, MEDICAL OFFICER.

On an estimated mean population of 129,341 the birth-rate in 1911 was 29·28 and the death-rate 30·76 per mille.

The admissions to the three Government hospitals numbered 3,099, as compared with 3,046 in 1910 and 2,696 in 1909.

The death-rate per cent. was 12·19 as against 11·65 in 1910 and 12·68 in 1909.

The public health throughout the year was good, with the exception of an epidemic of small-pox in the Central Province which cost 53 lives.

The spread of the epidemic was facilitated by the concealment of small-pox patients. About half a dozen convictions were obtained for this offence.

A similar epidemic occurred later in the year amongst the waterside labourers of the Prye River.

The accompanying table shows the relationship of the case mortality throughout the Province during the year to the presence or absence of vaccination marks:—

	Cases	Deaths	Per cent.
Vaccinated	198	15	7·57
Unvaccinated	157	63	40·12
Total ...	355	78	22·03

The water supply from Bukit Seraya has been of good quality. The reservoir is being enlarged. The analyses of the water from Bukit Panchor are very definitely condemnatory. A filter scheme of Jewell type is being prepared.

BUTTERWORTH HOSPITAL.

The principal diseases treated during the year were: Abscess, anæmia, beriberi, bronchitis, diarrhœa, dysentery, injuries, malarial fever, phthisis, pyrexia, ulcers, venereal diseases.

Among the more important operations were the following: Amputation, arm; circumcision, exploratory laparotomy, extraction of teeth, extraction of cataract, for cut throat, forceps delivery, incision abscess, paracentesis abdominis, reduction of dis-

RETURN OF DISEASES AND DEATHS IN 1911 AT THE FOLLOWING INSTITUTIONS:—

Butterworth, Bukit Mertajam, and Sungai Bakap Hospitals, Province Wellesley, Straits Settlements.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	7	1	7
Anæmia	48	10	50
Anthrax	—	—	—
Beriberi	51	3	55
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	10	—	10
Cholera	4	3	4
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	190	75	191
Enteric Fever	9	6	9
Erysipelas	2	1	3
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	53	—	55
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	—	—	—
Kala-Azar	—	—	—
Leprosy	14	1	14
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	123	—	124
Quartan	—	—	—
Irregular	14	8	14
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	165	33	165
(*d*) Malarial Cachexia	50	1	53
Malta Fever	—	—	—
Measles	14	—	15
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	3	—	4
Malignant	13	2	13
Old Age	—	—	—
Other Diseases	93	13	94
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	2	—	2
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	36	1	38
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	—	—	—
Sleeping Sickness	—	—	—
Sloughing Phagedæna	27	4	27
Small-pox	72	14	78
Syphilis	—	—	—
(*a*) Primary	26	—	26
(*b*) Secondary	188	—	192
(*c*) Tertiary	15	—	17
(*d*) Congenital	—	—	—
Tetanus	1	1	1
Trypanosome Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	15	4	17
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
GENERAL DISEASES—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	2	—	2
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	68	4	70
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	57	18	58
(*b*) Other Diseases	7	3	7
Digestive System—	—	—	—
(*a*) Diarrhœa	87	35	89
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	1	—	1
Congestion of Liver	1	—	1
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	7	—	7
(*g*) Cirrhosis of Liver	33	16	34
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	120	7	125
Ear	5	—	5
Eye	47	—	49
Generative System—	—	—	—
Male Organs	100	—	102
Female Organs	13	3	14
Lymphatic System	58	1	60
Mental Diseases	—	—	—
Nervous System	52	12	55
Nose	—	—	—
Organs of Locomotion	62	—	64
Respiratory System	177	44	182
Skin—	—	—	—
(*a*) Scabies	31	—	32
(*b*) Ringworm	6	—	6
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	17	—	17
(*f*) Other Diseases	407	—	413
Urinary System	50	15	50
Injuries, General, Local—	193	8	198
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	41	3	43
Parasites—	—	—	—
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	127	27	140
Filaria medinensis (Guinea-worm)	3	—	3
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	2	—	2
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	6	—	5
Surgical Operations—	235	—	235
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	6	—	6
(*b*) Iridectomy	1	—	1
(*c*) Other Eye Operations	1	—	1

located hip, scraping ulcers, skin grafting, spinal injection, suture of wounds of abdominal wall.

A microscopical examination of the blood in all fever cases has been carried out throughout the year. The stools of a large number of patients have been microscopically examined.

Vaccination.—Four thousand two hundred and thirty-three cases vaccinated during the year, of which 2,164 were emergency cases. The percentage of failures was 90·9.

Twenty-two autopsies were performed during the year on the bodies brought by the police. The Assistant Surgeon had also to inspect bodies with the Coroner at their respective places of death on several occasions.

Medical evidence was required in different courts about fifty times during the year.

Out of 1,806 vaccinations performed in all, 887 were emergency vaccinations for the epidemic. Of these 1,708 were inspected, with the result that 81·85 per cent. were perfect and 10·53 per cent. failed.

The epidemic of small-pox of last year continued for the major portion of this year. There were 231 cases in this district with 54 deaths. Of these 159 occurred from January to April, 2 in May, 7 in June, 55 in July and August, 2 in September, *nil* in October, 5 in November, and 1 in December.

SUNGAI BAKAP HOSPITAL.

Work Done.—Remaining from 1910, 35; admitted during 1911, 902; total treated, 937; average daily number of sick, 39·48; discharged, 767; transferred, 0; absconded, 5; died, 131; percentage of deaths to total treated, 13·98; percentage of deaths to total treated, excluding those dying within 48 hours of admission, 10·54.

There were 79 cases of malarial fever, with 8 deaths, and 37 cases of pulmonary tuberculosis, with 14 deaths.

Diagnosis in all cases being verified by microscopic examination. Eight cases of beriberi with no deaths. All cases of beriberi contracted the disease from outside the hospital.

The total treated is 120 less than in 1910.

Operations.—There were 62 cases of major and minor operations with 4 deaths. No death occurred under general anæsthesia.

ESTATE AND ESTATES HOSPITALS.

There are now some thirty estates to be visited by the Medical Officer, Province Wellesley, a task only possible while the service car is in good order. Improvement in the care of the coolies is noticed on most of the estates. Some are slow to move. Bertam and Batu Kawan are the most progressive. The dressers, working under certain disadvantages, have done their duties well.

Bertam Estate.—Good progress has been made in the re-housing of the coolies in permanent lines of improved type.

The drinking water is served by taps from a tank, the supply from which is pure, but of small quantity.

The precincts of the lines are polluted; latrines are to be provided.

Average number of coolies resident on estate in 1911: Tamils, 792; Javanese, 24; and Chinese, 717.

Malakoff Estate.—A new hospital and a new coolie line have been built on this estate. Drinking water is obtained from bricked wells by dippers.

Average number of coolies resident on estate in 1911: Tamils, 623; Javanese, 312; and Chinese, 58.

Prye Estate.—The coolies have been re-housed in lines of improved type.

Latrines are now provided. Care has been taken in the upkeep and improvement of the hospital. Water supply by taps from a hill reservoir.

Average number of coolies resident on estate in 1911: Tamils, 740; Javanese, 407; and Chinese, 96.

Batu Kawan Estate.—A new hospital has been built, and the coolies in the great part re-housed in lines of improved type. Ingenious latrines are installed to the great betterment of the health of the coolies. Drinking water from taps supplying sand filtered water from a hill reservoir and in part from rain water collected in properly screened tanks.

Average number of coolies resident on estate in 1911: Tamils, 651; Javanese, 423; and Chinese, 432.

Val d'or Estate.—The new hospital was occupied early in the year; its infectious ward fell down later The health of the estate is fair. The water supply is by dippers from tanks that contain water too hard to be palatable. Water is imported in casks and collected from the trees during rain storms. Water holes are dug wherever there appears an opportunity of obtaining a palatable supply. This estate must tackle this problem next year.

Average number of coolies resident on estate in 1911: Tamils, 119; Javanese, 186; and Chinese, 41.

Bakap Plantation.—The health of this estate has improved during the year. The water supply is from shallow wells of poor design.

Average number of coolies resident on estate in 1911: Tamils 292.

Caledonian Estate.—Some general improvement in the condition of the coolie lines of this estate has been shown during the year. Latrines are improved.

The water supply from Nibong Tebal reservoir has given rise to many complaints.

A new hospital has been started on a fresh site.

Average number of coolies resident on estate in 1911: Tamils 2,277, Javanese 714, and Chinese 699.

Byram Estate.—Some new and improved lines have been erected. The diminution in the number of cases of bowel disorders last year anticipated by Dr. Sheppard from the installation of tap water supply has been remarkable; 279 cases in 1911 as compared with 509 in 1910.

Average number of coolies resident on estate in 1911: Tamils 461, Javanese 672, and Chinese 262.

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MALACCA.

REPORT BY DR. A. H. KEUN, MEDICAL OFFICER.

The total number of births registered in 1911 was 3,942 (males 1,993, females 1,949), showing a decrease of 513 to 1910, when there were males 2,339, females 2,116. This, with the population obtained at the last census taken on March 10, 1911, shows a birth-rate of 31·77 per mille, compared with 45·04 per mille in 1910, and 41·03 per mille in 1909.

Death-rate.—The number of deaths recorded in 1911 was 7,159 (males 4,981, females 2,178) as contrasted with 5,188 in 1910 and 4,085 in 1909.

The general health of the Settlement, judging by the statistics given above, was most satisfactory. Last year was a record year for unhealthiness and for epidemics of malaria and small-pox. Severe outbreaks of malarial fever occurred throughout the Settlement, and estates which had never had malaria before showed a severe incidence. March, April, May, June, July, August and September saw the disease at its worst. During these months the admissions into the Government hospitals were greatly increased. The outbreak was general in town as well as country. Streets where malaria was formerly little known, *e.g.*, Heeren Street, Fort Terrace, Jonker Street, had several cases of locally contracted disease. With the view of destroying the breeding places of mosquitoes, the sanitary inspectors were instructed to pay particular attention to receptacles for water and to instruct householders to destroy or remove tins, vessels, broken bottles, &c., likely to hold stagnant water. With frequent inspections the mosquito pest gradually decreased, and it is now part of the ordinary routine of the sanitary inspectors to examine all likely breeding places of mosquitoes. From 123 admissions for malarial fever into Durian Daun Hospital in February, it rose to 146 in March, 228 in April, 278 in May, 272 in June, 267 in July, 196 in August, 188 in September. These figures are quoted to show that the increased admissions to hospital would imply increased prevalence in the Settlement. The great majority were of the malignant type. Coma and dysentery were frequent complications. Free quinine distribution was adopted. Gurus and police stations were supplied with quinine with instructions as to the quantity to be used. Small spoons to hold 5 gr. were given to all gurus, &c. Quinine was also supplied free of charge at the different dispensaries.

During the year small-pox continued throughout the Settlement, occurring sporadically in different districts at different times. In all 558 cases were reported with 173 deaths, giving a percentage mortality of 31·00, which compares favourably with death-rates from similar epidemics in other places. As in 1910, the majority of cases occurred in the Alor Gajah District, viz., 252 cases with 60 deaths (*i.e.*, a percentage of 23·80). The Central District had 213 cases with 84 deaths (39·43 per cent.). The Jasin District 93 cases with 29 deaths (31·18 per cent.). In several districts severe outbreaks occurred.

It is interesting to note that the several outbreaks showed a higher mortality among unvaccinated people. The fact that it was the unvaccinated or not recently vaccinated people who were chiefly affected led to our vaccination campaign being more successful. In most cases the Malays themselves realized this and begged for the operation to be done on them.

With the view of pushing on the vaccinations among the Malays, who were the people chiefly affected with small-pox (Malays 416 cases, Chinese 95, Tamils 26, Eurasians 19, Burmese 1, Sikh 1), Gurus in vernacular schools were taught to vaccinate and were provided with lancet, lymph, &c., for vaccinating in their respective districts. Returns of their results were submitted monthly, while cases vaccinated by them were inspected by some of the medical staff. Twenty cents were given for each successful case. The frequent inspection kept the returns accurate. In all some 8,241 vaccinations were performed by them with 5,522 successful ones. These results are very satisfactory as they reach a class of people who are very difficult to get at, as nearly all Malays have a dislike to vaccinations, which they accuse of bringing on several diseases and even of producing small-pox, besides incapacitating them from work from the vaccination complications, *e.g.*, fever, inflamed arms and glands, &c. As most of the vaccinations were done in open streets, market places, common lodging-houses, &c., they were unable to be examined afterwards.

The number of births within municipal limits was 627 (males 319, females 308), as against 659 (males 337, females 322) in 1910.

The number of deaths was 1,223 (males 924, females 299), as against 879 (males 571, females 308) in 1910. The infantile mortality was 238 in children under one year of age, giving a percentage mortality of 37·95 to the total births.

PAUPER HOSPITAL.

Malarial fever accounted for the greatest number of admissions, *viz.*, 2,252 with 139 deaths, giving a percentage of 6·17. The microscopic examination for malarial parasites in all cases of fever, whether admitted for it or developing while under treatment for other diseases, was continued.

Dysentery showed a great increase, viz., 250 cases with 118 deaths. The very high mortality from it can only be attributed to the cases being admitted in an advanced stage of the disease, in most cases the patients being admitted to die in hospital so as to obtain free burial.

Beriberi accounted for 765 admissions with 75 deaths, or 9·80 per cent.

RETURN OF DISEASES AND DEATHS IN 1911 AT THE FOLLOWING INSTITUTIONS:—

General, Pauper, Contagious Disease, Leper, Prison, Alor Gajah, and Jasin Hospitals, Malacca, Straits Settlements.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	2	—	2
Anæmia	98	16	105
Anthrax	—	—	—
Beriberi	810	90	902
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	32	—	34
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	—	—	—
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	378	177	391
Enteric Fever	—	—	—
Erysipelas	3	1	3
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	79	—	81
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	—	—	—
Kala-Azar	—	—	—
Leprosy	10	3	11
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	262	2	270
(*a*) Intermittent	86	1	86
Quotidian	5	1	6
Tertian	—	—	—
Quartan	—	—	—
Irregular	—	—	—
Type undiagnosed	—	—	—
(*b*) Remittent	122	26	122
(*c*) Pernicious	2292	195	2331
(*d*) Malarial Cachexia	—	—	—
Malta Fever	—	—	—
Measles	5	—	5
Mumps	10	—	10
New Growths—	—	—	—
Non-malignant	5	—	6
Malignant	10	4	12
Old Age	—	—	—
Other Diseases	156	35	158
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	51	—	53
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	1	—	1
Septicæmia	1	1	1
Sleeping Sickness	—	—	—
Sloughing Phagedæna	73	43	73
Small-pox	468	105	482
Syphilis	161	—	177
(*a*) Primary	—	—	—
(*b*) Secondary	—	—	—
(*c*) Tertiary	—	—	—
(*d*) Congenital	—	—	—
Tetanus	2	—	2
Trypanosome Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	5	2	7
(*c*) Lupus	—	—	—
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	—	—	—
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	99	4	101
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	4	2	4
(*b*) Other Diseases	1	1	1
Digestive System—	—	—	—
(*a*) Diarrhœa	285	138	290
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	1	—	1
(*d*) Abscess of Liver	2	1	2
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	6	1	7
(*g*) Cirrhosis of Liver	41	20	43
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	1	1	1
(*j*) Other Diseases	—	—	—
Ear	2	—	2
Eye	93	1	101
Generative System—	—	—	—
Male Organs	91	1	92
Female Organs	8	1	8
Lymphatic System	41	—	44
Mental Diseases	—	—	—
Nervous System	69	10	77
Nose	1	—	1
Organs of Locomotion	31	1	36
Respiratory System	279	97	288
Skin—	—	—	—
(*a*) Scabies	97	—	100
(*b*) Ringworm	4	—	4
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	37	—	38
(*f*) Other Diseases	1151	1	1200
Urinary System	66	21	73
Injuries, General, Local—	159	4	165
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	—	—	—
Ascaris lumbricoides	1	—	1
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	371	87	383
Filaria medinensis (Guinea-worm)	4	—	5
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	10	—	10
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	15	—	15
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	1	—	1
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

JASIN HOSPITAL.

The year 1911 was notorious for unhealthiness and in consequence the hospital was often overcrowded. A large number of the admissions were estate coolies, chiefly from Bukit Asahan, Jasin, Rim, Kemendore, Bukit Kajang, Ayer Panas and Garing. In all some 1,042 estate coolies were admitted.

There was a great increase in the number of females treated in hospital, rising from 70 in 1910 to 105 in 1911. The total number of cases treated was 1,623, showing an increase of 575 as compared with 1910, with a daily average of 95·63.

Malarial fever, as usual, claimed the largest number of admissions, viz., 497 cases with 63 deaths, or 12·67 per cent. Dysentery and enteritis came next with 176 cases and 63 deaths, or 35·79 per cent. Beriberi had 137 admissions with 15 deaths, or 10·95 per cent. Ulcers 169 with no deaths. The death-rate for the year was 12·69 per cent., but deducting deaths occurring within 48 hours of admission it was 8·63 per cent. Pulmonary phthisis showed the highest mortality, viz., 46·34 per cent., dysentery 42·73 per cent., small-pox 20·54 per cent. As most cases are admitted into hospital in a very grave or advanced stage of the disease this high mortality is not surprising. Small-pox continued throughout the year in the Jasin District, and it became necessary in 1911 to erect a new temporary shed in the Quarantine Camp. One hundred and thirty-four cases of small-pox, chicken-pox, measles, and observation were treated in the Camp with a death-rate of 11·19 per cent. Of the 1,623 admissions, Tamils were 830, Chinese 540, Malays 243, and Indians 10.

ALOR GAJAH DISPENSARY.

This year was a memorable one in Alor Gajah District for the continuance of the epidemic of small-pox, which started in 1910 and lasted throughout 1911, causing 252 reported cases, 228 being admitted into the Quarantine Camp for treatment. There were 60 deaths, of which 43 occurred in the Camp. With the view of suppressing the disease Assistant-Surgeon de Cruz was stationed at Alor Gajah from December 13, 1910, to May 8, 1911, Dresser R. Lazaroo from April to June, Dresser M. Danker from April to May, while Dresser Nonis was sent to Sungai Bahru. Vaccinations were pushed so that there were 7,803 vaccinations done in 1911.

GAOL HOSPITAL.

There were 23 cases treated, with 1 death. The larger number of admissions this year was due to a number of vagrants being arrested by the police and sent to prison. These men were for the most part broken down, debilitated and diseased individuals. Of the 23 admissions, 8 were for diarrhœa, 5 for malarial fever, 4 for anæmia, 3 for dysentery, 1 mumps, 1 colic, and 1 abscess.

ESTATE HOSPITALS.

Bukit Asahan Central Hospital.—This hospital has seen may changes in its staff. The present Estate Medical Officer joined early in the year and the hospital at once showed signs of improvement. There is a good supply of drugs and instruments, while the dietary is very carefully attended to. The returns of these hospitals show an increase in the admission with a high death-rate. This was the result of an unfortunate experiment made of introducing Tamil labour, care not being taken to see that only agricultural labourers and healthy people were selected. As these coolies were likely to be a drag on the estates besides filling the hospitals and increasing the death-rate, the Company arranged to repatriate all who desired it and so several hundreds were sent back to India. The heavy mortality, viz., 10·6 per cent., amongst the Tamil coolies was due to malaria and dysentery. As prophylactic measures for the former, quinine was served out to all coolies, and ravines drained as far as practicable. Certain lines proved regular malarial haunts and had to be abandoned, the coolies being removed to other and healthier lines. As this estate, like all Malacca itself, has swamps and jungle belts all over it, the question of the eradication of malaria is a difficult if not hopeless one. Great improvements, however, can be made and are being now done. Dysentery accounted for 466 admissions with 117 deaths. The dirty habits of the Tamils, their partiality for polluted water, their ignorance of cleanliness and care in dietary for bowel disorders, and, above all, their quick depression and home sickness, all tended to produce a high mortality. Careful dietary is the prime factor of treatment, and this cannot be secured among a people who clamour for curry and rice and who manage to get unwholesome and deleterious food-stuff smuggled in to them when under treatment in hospital.

During the year 8,025 in-patients were treated in the Central and Divisional Hospitals with 396 deaths, giving a percentage mortality of 4·9. The daily average number of coolies, including all nationalities, was 6,000, thus the estate had a death-rate of 66 per mille. Out of 396 deaths 263 occurred among Tamils, and as recruiting from India has now been stopped and as several sanitary measures are in progress, there is every prospect of Bukit Asahan becoming healthier.

PENANG PAUPER WARD.

REPORT BY DR. J. S. WEBSTER, MEDICAL OFFICER.

During the year the patients have been placed in the upper storey of the Female ward.

A new latrine connected to the ward by a covered way has been erected and is used only by these patients; two new bathrooms have also been built.

There have been 266 admissions with 15 deaths, against 148 admissions in 1910 with 12 deaths, which shows an increase of 79 per cent. in the number of patients and a decrease of 25 per cent. in the mortality.

The majority of patients were Chinese. The chief cause of death was phthisis.

QUARANTINE.

Report by Dr. G. E. Brooke, Port Health Officer, Singapore.

During the year 2,100 visits were paid to vessels, which included the examination of 110,882 crew and 427,409 passengers.

Of these ships, 75 were infected: Small-pox, 40; plague, 4; cholera, 31.

The s.s. *Hygeia* was used for disinfecting purposes on 208 occasions, and was also used 19 times for transport of police and heavy stores to St. John's Island.

The extra amount of work done by the s.s. *Hygeia* this year is accounted for by the declaration of Singapore as an infected port (plague) by the Dutch Government.

To oblige the shipping firms, therefore, all outgoing steamers for Dutch ports were disinfected prior to departure, as is always done for the Australian ships. The Dutch Government have now established a plant at Pulau Samboe which has greatly relieved the pressure.

In a large and busy port like Singapore a second disinfecting launch is almost a *sine quâ non;* the matter of providing for this is now under consideration.

By courtesy of the Marine Department a Health Certificate Form was presented to the surgeon or master of 5,700 vessels which, being not in quarantine or not from an infected port, are not boarded by the Port Health officials. These certificates represented 292,896 crew and 306,654 passengers, of whose health the Port Health Department was thus immediately informed.

Cases of deaths occurring on steamers or sampans in the port numbered 46. Of these, 39 were allowed ashore for burial and 7 suspicious corpses were sent to St. John's for *post-mortem* examination and burial.

Nineteen visits were paid to the Government Marine quarters. Two cases of cholera occurred in the engineers' quarters during the year. The contacts were promptly removed to St. John's and no further cases occurred. The house was vacated after disinfection. The origin of the cases was not traceable. The health of the staff has been on the whole fairly good.

Quarantine Station.—The station was occupied every day of the year. The total number of passengers landed was 53,961, as compared with 35,062 the previous year. The maximum number on any day was 4,892.

The total sick treated in hospital was 1,612; the daily average being 41·2 and the maximum number on any one day being 150. The number of deaths totalled 387, giving a death-rate of 24 per cent.

The rainfall was 60·84 in.—an exceptionally dry year.

Vaccinations were done on the station to the number of 1,972.

During the year the distilling plant worked well, 942,450 gallons of water being produced.

Cholera having broken out at Pasir Panjang amongst the lunatics and beriberi patients, 146 were removed to St. John's on August 19, 2 more on August 21, and 87 on August 24. Five cases occurred on admission, 9 subsequently, and also 2 amongst the attendants, making a total of 16 cases, of whom 14 died. There were also 3 deaths from other causes. The remainder were discharged on September 19, with the exception of a few convalescents in hospital. The disease appeared at first to be spreading rapidly, and I attribute its speedy decline to the administration of eucalyptus oil as a prophylactic, and to the perpetual insistence on hand-washing before eating. General cleanliness and fly prevention seem to be of slight avail unless accompanied by these two precautions.

The Public Works Department have erected a sample latrine on a plan with which I furnished them. This has not yet had a trial. The model is one evolved, after some thought, as a suitable one for estates, &c., where no water system is available. The principle is that of two rollers with an endless canvas belt. The lower portion of the belt is perpetually immersed in a tank containing a thin solution of tar. The upper portion forms the fæcal catchment area and is the sole floor of the building—the squatting bars being raised above it.

A few turns of the roller suffice to remove the fæces into one collecting box, and at the same time a freshly-tarred surface is replaced for use.

If foul the belt can easily be removed and burnt and a new one inserted. It should ensure a maximum of cleanliness and a minimum of scavenging labour.

Only two prosecutions were undertaken during the year. One was in the matter of the s.s. *Curonia*, a Russian vessel, which brought coolies from Amoy and Swatow. A cholera epidemic had occurred during the voyage and the report of this was suppressed by the officials. As the ship was then apparently healthy the coolies were all released and came ashore in Singapore. The result was a small epidemic in the town, which fortunately did not last many weeks. The master was discharged and the doctor fined $500.

The other prosecution was that of some Tamils who had buried their dead small-pox child beneath the floor of their kitchen at Siglap. In this case there was a sentence of $50 or three weeks imposed.

PENANG.

Report by Dr. J. C. C. Ford, Medical Officer.

During the year 1,144 vessels were visited and 61,336 crew units and 215,815 passengers were inspected.

During the cholera epidemic in Kedah particular attention was directed to junk traffic from Kedah ports. In the months of February, March, April, May and June 310 junks with 1,500 members of crew and 19 passengers were detained in quarantine and released after disinfection of water tanks, &c.

Colonial Medical Reports.—No. 23.—Straits Settlements—(*continued*).

Under the Pilgrim Ships Ordinance 8 vessels were inspected and cleared for Camaran and Jeddah. The number of pilgrims embarking at this port was 1,882. Small-pox infection occurred on 7 out of the 13 vessels carrying Hadjis returning from the Hedjaz. One vessel was infected with bubonic plague as well.

Small-pox.—The large majority of the cases were imported from Jeddah. Out of 96 cases removed from vessels, 83 were removed from pilgrim vessels. Thirty-two cases were landed in quarantine from one vessel alone.

Cholera.—Nine cases were imported: From Kedah, 1; Negapatam, 7; Asahan (Sumatra), 1.

The cases from Kedah and Asahan occurred among the crew.

On one occasion, when cholera was epidemic in Madras, the usual weekly vessel arrived with infection in the first and second saloons and 'tween decks.

Plague.—One case bubonic plague was removed from a vessel arriving here from Rangoon.

The number of vessels, junks, &c., which required inspection on arrival here was larger than usual. Cholera was epidemic in Kedah, the west coast of Siam and Lower Perak from February to July. The increase in immigration from India, through Madras and Negapatam, necessitated extra vessels being put on the run during the months of May, June and July.

PULAU JEREJAK.

The old Quarantine Station was occupied throughout the year. The new Station at Sungai Panchor, Pulau Jerejak, was occupied on April 6. It was intended when the new station was opened to vacate the old station, but the abnormal rush in immigration from Madras and Negapatam and the combined occurrence of cholera among them necessitated the re-occupation of the old station. During the last few months of the year a limited portion only of the new station was available while structural alterations and additions were being carried out.

The number of passengers detained for observation, sickness, &c., from 214 vessels was 134,957, which includes 61,690 immigrant coolies.

The maximum number in detention on a single day on the combined stations was 11,738; the maximum numbers at the new and the old stations were 10,126 and 5,963 respectively.

Vaccinations (including re-vaccinations) to the number of 73,988 were done by the Vaccinator. One adult male developed small-pox, in a modified form, eight days after successful vaccination. One adult female and one adult male, who both bore good marks of vaccination, done in infancy, and who subsequently had small-pox, as evidenced by their pitted appearance, were successfully vaccinated; the vesicles, however, were not typical.

There was a scarcity of water during the months of March, April, July and August, and fresh water was conveyed to both stations from town in water-boats. These were months of drought and both reservoirs ran dry.

Cholera.—The outbreak of cholera, during the months of June and July, occurred among the immigrant coolies intended for estate labour. These epidemics have occurred regularly since 1904, during the months June to September; this season coincides with the times of want and privation in the recruiting districts in India, and the subsequent rush of immigration to the Straits Settlements.

On June 22 no more could be accommodated at either Quarantine Station, and the *Teesta*, which arrived here infected, was sent on to Singapore, where the passengers were removed to the Quarantine Station on St. John's Island.

From July the coolies for Selangor Estates were sent direct to the temporary Quarantine Camp at Port Swettenham for observation and disinfection instead of being quarantined in Penang.

As a prophylactic, cholera vaccine was obtained from the Pasteur Institute, Weltevreden, Batavia, and 1,176 inoculations were done.

Several cases of cholera had occurred among coolies. These inoculations were done when the epidemic had practically ceased, and so it was not possible to estimate the efficacy of the prophylactic. However, no further cases occurred among those inoculated, and it was possible to release them after the fifth day.

The vaccine was injected subcutaneously into the skin of the back, inside and next to the top of the left shoulder-blade; the dose for an adult being 1 c.c., for children from 5 to 15 years $\frac{3}{4}$ c.c., and for those from 2 to 5 years $\frac{1}{2}$ c.c.; infants in arms were not inoculated.

Within twenty-four hours there was some reaction with swelling and tenderness at the point of injection and very mild indisposition.

The majority of those inoculated on July 21 refused food the next day; this was not noticed among those inoculated on July 31 and August 1; this reaction passed away within thirty-six hours; there were no accidental ill-effects.

MALACCA.

On October 14 a case of cholera occurred in a Chinese deck passenger on board the *Lady Weld* from Singapore bound for Muar. The steamer after disinfection was ordered back to Singapore with the passengers for quarantine.

From that date all steamers coming from Singapore were visited for the inspection of all passengers and crew. Up to the end of the year 177 vessels were thus inspected. Six thousand three hundred and eight passports were issued to passengers permitted to land, and opportunity was taken to get landing passengers vaccinated. In all 4,610 passengers were thus vaccinated.

PATHOLOGICAL DEPARTMENT.

Report by Dr. G. A. Finlayson, Government Pathologist.

Laboratory.—During the year 895 specimens were

examined, as compared with 879 in 1910 and 1,258 in 1909, 744 being sent in from the various Government institutions, while 151 were submitted by private practitioners.

Malaria.—The parasite was demonstrated in 44 blood films, the majority as usual showing a subtertian infection. In 93 instances no parasite was observed.

Widal Reaction.—In 157 instances, as compared with 82 in 1910 and 202 in 1909, there was a positive reaction, this again representing a somewhat lesser number of cases of enteric fever, as in several cases the blood was examined on more than one occasion. The reaction was negative in 424 specimens.

The only noticeable feature is the marked rise towards the latter part of the year, there being almost as many positive reactions in the three months September to November as in the rest of the year.

Tuberculosis.—In 28 samples of sputa T.B. were demonstrated; in 67 others none were observed.

Diphtheria.—Six swabs from the fauces of suspected cases of diphtheria were examined, but from none was the specific organism cultivated.

Gonorrhœa.—Twenty smears of urethral or vaginal discharge were examined; in 8 the diplococci were noted.

Various.—Other samples included three of urine for casts, &c., 23 of fæces for amœbæ or ova, 6 blood films for differential count, several pieces of tissue for microscopical diagnosis, and 2 positive leprosy smears.

Water: Municipal Supply.—Fifty-two specimens were examined, the weekly sample being taken from standpipes scattered over the municipal area. The standard remains fairly constant, the average number of micro-organisms per cubic centimetre being 305 on agar and 280 on gelatine medium, as compared with an average of 240 on agar in 1910. In MacConkey's medium ·25 c.c. produces gas and acid within twenty-four hours.

THE MEDICAL DEPARTMENT, LABUAN.

REPORT BY DR. T. C. CLEVERTON, MEDICAL OFFICER.

Table showing the estimated population, with the birth- and death-rates, for the years 1909 to 1911 :—

Year	Estimated population	Births	Deaths	Birth-rate per mille	Death-rate per mille
1909	8,231	183	197	22·23	23·93
1910	8,199	235	267	28·66	32·56
1911	6,545	189	183	28·87	27·97

These figures are according to the returns of the Census taken on March 10, 1911. The total number of males was given as 3,932, females as 2,613. The different nationalities were not grouped and numbered. This is the first year since 1906 that the births have outnumbered the deaths in Labuan. There are no figures prior to 1906.

The marked decrease in the population since 1910 is due to the exodus which took place at the time of the closure of the coal mines at Coal Point early in January.

Of the total number of deaths, 57 were ascribed to "fever," 23 to pulmonary tuberculosis, 16 to debility and age, 10 to beriberi, and 6 to dysentery.

No epidemic disease has occurred during the year. Two cases of small-pox were isolated in a hospital building; one of these was taken from the s.s. *Marudu*, and the other occurred in Labuan. Both had been vaccinated a short time previously, and were mild cases.

Malaria.—This disease is very prevalent. During the year 118 cases were admitted to hospital out of a total of 276 admissions, and 479 cases were treated as out-patients. Fifty-seven deaths were attributed to "fever" out of a total mortality of 183, compared with 70 deaths out of a total of 267 deaths in 1910. The type of malaria has been severe during the year under review, 31 cases being subtertian as against only 19 in 1910. Practically all new police become infected within a month of their arrival in Labuan. Some of these cases may be relapses, but many of them appear to be genuine new infections. This was strikingly evident when a number of police were sent up from Singapore early in the year.

Beriberi.—Thirty-four cases have been admitted to hospital, compared with 44 in 1910. The number of deaths in hospital under this disease was 6, as against 18 in 1910. Parboiled rice was given throughout the year except towards the middle of December, when the supply temporarily failed. The adoption of parboiled rice may have been a factor in decreasing the mortality rate of the patients under treatment, but it was noted that the disease was not so far advanced in those admitted as was seen in most of the cases in 1910.

Venereal Diseases.—Fourteen cases were admitted during the year.

Pulmonary Tuberculosis.—Eight cases were admitted to hospital during the year, as against 11 in 1910. Twenty-three deaths were attributed to this disease, making a percentage of 12·56 of the total death-rate.

Dysentery and Diarrhœa.—Thirteen cases were admitted to hospital during the year, as against 9 in 1910. Eight deaths were attributed to these diseases.

Police Force.—The general health of the police throughout the year was satisfactory except for malaria. The number of cases of all diseases amongst the force admitted to hospital was 67 (the same number as last year), of which 38 were admitted for malaria. Three deaths occurred amongst the police, one from cerebro-spinal fever, one from malaria, and one man was murdered.

Prisoners.—The general health of the prisoners was excellent throughout the year. No prisoners died, but there were two deaths in hospital amongst the vagrants committed to the House of Detention.

Out-patients.—The total number treated during the year was 915. The number of Malays presenting themselves as out-patients for treatment is steadily increasing.

Sanitation.—An inspector was appointed under the Sanitary Board at the beginning of the year,

Return of Diseases and Deaths in 1911 in the Labuan Hospital,

Straits Settlements.

GENERAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Alcoholism	—	—	—
Anæmia	1	—	1
Anthrax	—	—	—
Beriberi	34	6	44
Bilharziosis	—	—	—
Blackwater Fever	—	—	—
Chicken-pox	—	—	—
Cholera	—	—	—
Choleraic Diarrhœa	—	—	—
Congenital Malformation	—	—	—
Debility	6	2	6
Delirium Tremens	—	—	—
Dengue	—	—	—
Diabetes Mellitus	—	—	—
Diabetes Insipidus	—	—	—
Diphtheria	—	—	—
Dysentery	11	3	11
Enteric Fever	—	—	—
Erysipelas	—	—	—
Febricula	—	—	—
Filariasis	—	—	—
Gonorrhœa	1	—	1
Gout	—	—	—
Hydrophobia	—	—	—
Influenza	—	—	—
Kala-Azar	—	—	—
Leprosy	—	—	—
(*a*) Nodular	—	—	—
(*b*) Anæsthetic	—	—	—
(*c*) Mixed	—	—	—
Malarial Fever—	—	—	—
(*a*) Intermittent	—	—	—
Quotidian	—	—	—
Tertian	81	2	83
Quartan	1	—	1
Irregular	31	3	32
Type undiagnosed	—	—	—
(*b*) Remittent	—	—	—
(*c*) Pernicious	—	—	—
(*d*) Malarial Cachexia	5	1	6
Malta Fever	—	—	—
Measles	—	—	—
Mumps	—	—	—
New Growths—	—	—	—
Non-malignant	—	—	—
Malignant	—	—	—
Old Age	—	—	—
Other Diseases	2	1	2
Pellagra	—	—	—
Plague	—	—	—
Pyæmia	—	—	—
Rachitis	—	—	—
Rheumatic Fever	—	—	—
Rheumatism	—	—	—
Rheumatoid Arthritis	—	—	—
Scarlet Fever	—	—	—
Scurvy	—	—	—
Septicæmia	1	—	1
Sleeping Sickness	—	—	—
Sloughing Phagedæna	—	—	—
Small-pox	2	—	2
Syphilis	—	—	—
(*a*) Primary	1	—	1
(*b*) Secondary	5	—	5
(*c*) Tertiary	1	—	1
(*d*) Congenital	—	—	—
Tetanus	—	—	—
Trypanosome Fever	—	—	—
Tubercle—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—
(*b*) Tuberculosis of Glands	—	—	—
(*c*) Lupus	—	—	—
General Diseases—*continued.*			
(*d*) Tabes Mesenterica	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—
Other Tubercular Diseases	—	—	—
Varicella	—	—	—
Whooping Cough	—	—	—
Yaws	3	—	3
Yellow Fever	—	—	—

LOCAL DISEASES.

	Admissions	Deaths	Total Cases Treated
Diseases of the—			
Cellular Tissue	—	—	—
Circulatory System	—	—	—
(*a*) Valvular Disease of Heart	2	1	2
(*b*) Other Diseases	—	—	—
Digestive System—	—	—	—
(*a*) Diarrhœa	—	—	—
(*b*) Hill Diarrhœa	—	—	—
(*c*) Hepatitis	—	—	—
Congestion of Liver	—	—	—
(*d*) Abscess of Liver	—	—	—
(*e*) Tropical Liver	—	—	—
(*f*) Jaundice, Catarrhal	—	—	—
(*g*) Cirrhosis of Liver	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—
(*i*) Sprue	—	—	—
(*j*) Other Diseases	—	—	—
Ear	—	—	—
Eye	3	—	3
Generative System—	—	—	—
Male Organs	—	—	—
Female Organs	—	—	—
Lymphatic System	—	—	—
Mental Diseases	2	—	2
Nervous System	5	—	5
Nose	—	—	—
Organs of Locomotion	—	—	—
Respiratory System	12	3	13
Skin—	—	—	—
(*a*) Scabies	—	—	—
(*b*) Ringworm	—	—	—
(*c*) Tinea Imbricata	—	—	—
(*d*) Favus	—	—	—
(*e*) Eczema	—	—	—
(*f*) Other Diseases	—	—	—
Urinary System	—	—	—
Injuries, General, Local—	—	—	—
(*a*) Siriasis (Heatstroke)	—	—	—
(*b*) Sunstroke (Heat Prostration)	—	—	—
(*c*) Other Injuries	—	—	—
Parasites—	—	—	—
Ascaris lumbricoides	—	—	—
Oxyuris vermicularis	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—
Filaria medinensis (Guinea-worm)	—	—	—
Tape-worm	—	—	—
Poisons—	—	—	—
Snake-bites	—	—	—
Corrosive Acids	—	—	—
Metallic Poisons	—	—	—
Vegetable Alkaloids	—	—	—
Nature Unknown	—	—	—
Other Poisons	—	—	—
Surgical Operations—	—	—	—
Amputations, Major	—	—	—
,, Minor	—	—	—
Other Operations	—	—	—
Eye	—	—	—
(*a*) Cataract	—	—	—
(*b*) Iridectomy	—	—	—
(*c*) Other Eye Operations	—	—	—

and the appearance and general condition of Victoria has considerably improved.

Vaccination.—The number of cases vaccinated was 229, as against 235 in 1910. Seventy-one were done by a private medical practitioner. Of the total number vaccinated 205 were successful, 14 were failures, and 10 were not seen. There were 43 vaccinations done on infants of 3 months and under, 106 on children of 4 months to one year, and 80 people of one year and over.

Meteorological.—The north-east monsoon started about the end of January and lasted to the beginning of April; during this time the rainfall was so small as to occasion a shortage of water in the hospital well with total failure in March. The south-west monsoon blew from the beginning of April to the middle of October, when the north-east monsoon set in again, and blew to the end of the year. The total rainfall was only 99·82 in., being the lowest on record for at least six years. In 1910 the total rainfall was 151·25 in. The wettest month was October, with 26·18 in. The greatest rainfall in the twenty-four hours occurred on October 19, when 5·65 in. fell. The highest temperature recorded was 94° F. on January 18, and the lowest temperature was 71° F., which was recorded on three occasions during the year.

The Hospital.—The total number of admissions was 276, including 7 Europeans, and the total number treated in hospital was 296. Eleven remained over in hospital at the end of the year. Twenty operations were done on in-patients. There were 22 deaths in hospital, giving a percentage of deaths to total treated of 7·43. Seven deaths occurred within twenty-four hours of admission.

The chief diseases treated in hospital during the year were malaria 122, with 4 deaths; beriberi 44, with 6 deaths; pulmonary tuberculosis 9, with 8 deaths; and dysentery 11, with 3 deaths.

Colonial Medical Reports.—No. 24.—Northern Nigeria.

MEDICAL REPORT FOR THE YEAR 1910.

By J. P. FAGAN.

Acting Principal Medical Officer.

THE general health of both Europeans and natives in the Protectorate during the year may be considered as satisfactory when compared with past years.

The general character of the diseases prevailing showed little change.

During the year 3,899 paupers were treated at the expense of the Government.

Appended is a list of cases of blackwater fever:—

Number of cases, 9; rate per 1,000 of average population, 14·12; number of deaths, 2; case of mortality per cent., 22·2.

There were 3,942 successful vaccinations performed.

METEOROLOGY.

Detailed monthly reports are submitted from eighteen stations. They are accepted as reliable by the Meteorological Society. The medical officer of each station is responsible for the record. Highest shade temperature—114° F. at Geidam, March 23, and at Maiduguri on March 26. Lowest shade temperature—39° F. at Sokoto on January 4. Highest mean shade temperature—84·2° F. at Baro. Lowest mean shade temperature—76·3° F. at Ankpa. Greatest rainfall (annual total), 56·44 in. at Ankpa. Greatest fall on one day—5·53 in. on August 6 at Zungeru. Lowest rainfall (annual total), 16·87 in. at Geidam (no record for May). Greatest range of temperature—73° F. at Maiduguri 114°—41° F.

There is a European and native hospital at each of the following stations: European—Lokoja, 12 beds. Baro, temporary for Baro-Kano Railway construction. Zungeru, 12 beds. Native—Lokoja, 52 beds. Baro, temporary for Baro-Kano Railway construction. Zungeru, 48.

TABLE SHOWING THE SICK, INVALIDING, AND DEATH-RATES OF EUROPEAN OFFICIALS.

	Official	Non-official	Total
Total number of officials resident	—	—	—
Average number resident	424	213	637
Total number on sick list	—	—	1,039
Total number of days on sick list	—	—	—
Average daily number on sick list	—	—	—
Percentage of sick to average number resident	—	—	163 1
Average number of days on sick list for each patient	—	—	—
Average sick time to each resident	—	—	—
Total number invalided	31	17	48
Percentage of invalidings to total residents	7·3	7·9	7·5
Total deaths	7	6	13
Percentage of deaths to total residents	—	—	—
,, ,, ,, average number resident	1·65	2·81	2·04
Number of cases of sickness contracted away from residence	—	—	—

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At every other station a hospital for natives is erected if necessary.

In the out-stations Europeans are treated in quarters.

RETURN OF STATISTICS OF POPULATION FOR THE YEAR.

	Europeans and Whites
Number of inhabitants in 1909	544
,, births during the year 1910	—
,, deaths during the year 1910	13
,, immigrants during the year 1910 ...	—
,, emigrants during the year 1910 ...	—
,, inhabitants in 1910	637
Increase	93

SANITATION.

During the year, in the course of touring, I personally visited a considerable part of the Protectorate.

In April I inspected the whole length of the railway from Baro to a point 27 miles beyond Zaria: partly running line and partly the distal earthworks with the type-camps.

During July my travelling began at Zungeru, was continued via Minna along the course of the railway to Zaria and back to Zungeru on August 6.

In the course of this tour I arranged, in association with the Resident of the district there, the laying out of a new town at Minna for the rapidly growing native population.

I then laid down certain principles to be adopted in the laying out of new native towns. His Excellency assented to these principles with some reservation.

The important point is that the principle has been laid down that, in future, all new towns in the Protectorate shall be laid out in straight lines with broad thoroughfares, that a straight lane shall separate the mutual backs of parallel rows of compounds, that no compound shall front a thoroughfare less than 50 ft. broad, and that the regularity of the thoroughfares shall be maintained by the compounds being kept of a uniform depth.

On arrival at Zaria I found His Excellency himself there, and he invited my advice on the laying out of the station there, "from the point of view of sanitation."

His Excellency expressed his intention to embody the advice given in the standing instructions for the laying out of new stations.

While at Zaria, also, I had—in association with Mr. Resident Withers-Gill and Dr. Porteous, the Medical Officer—a consultation with the Emir touching the sanitation of the city of Zaria, and, incidentally, of the other towns in his emirate. For an African, the Emir, although an old man for a native, is wonderfully receptive of and responsive to new ideas.

The chief points dealt with during the interview with the Emir were the dangers arising from flies and mosquitos, and the means of keeping those insects down; the necessity for utilizing the mud from broken down walls and ruinous houses for the filling up of the borrow-pits; the obligation resting upon him to see that future mud for house building was brought from a distance, and preferably from the banks of a stream; the necessity for protecting wells by parapets and keeping them mosquito-proof; and the cause of barrenness and of infantile mortality together with the means of fighting against them.

At Zungeru, the capital of the Protectorate, great sanitary improvements have been effected. As a consequence of this, flies are much less numerous than they were formerly.

In August I left Zungeru on another tour of inspection. The first place visited was Lokoja, the oldest centre of European activity in Northern Nigeria, and which, with its large native town, has been, until recently, probably the most insanitary one in the whole Protectorate.

In the early days of Imperial administration Lokoja was a large military centre; the medical staff were largely absorbed by military expeditions and patrols; the administration had little time or money to devote to sanitation; and, consequently, vested interests were allowed to grow up in Lokoja native town, which every year rendered much-needed radical sanitary reform more and more difficult.

I went into the whole matter of the native town with His Excellency the Governor, who seized this opportunity of dealing drastically with the existing state of affairs. The plan for reform suggested by me was to the effect that the entire native town should be transferred to a new site across the Mimi, a small stream which enters the Niger below Lokoja.

The difficulty at Lokoja demonstrates the embarrassments which are bound to arise. The sanctioned plan of improvement was at once proceeded with, and is now being gradually carried out.

In the course of the journey up and down the Benue, Yola, Niuman, Lau, Ibi, Abinsi, Loko, and Bogana were visited.

At Yola recommendations were made touching the gradual transfer of the station to a better site, and numerous sanitary questions were discussed.

At Niuman, Lau, Loko, and Bogana nothing could be done; but notes were taken of the existing state and more clamant requirements.

At Ibi, the most important town on the Benue and the headquarters of Muri province, a week was spent, and the condition of the place was gone into carefully.

At Abinsi the whole condition of the place was discussed with the medical and political officers.

At high river marshes extend along both banks of the Benue practically all the way from Yola to Lokoja; and, in the dry weather, along many extensive reaches. It would be impossible to render the places bordering the river sanitary, in the perfect sense of the term. But improvements are being steadily carried on; material changes for the better within a reasonable time.

The province of Bassa more closely resembles the Southern Nigerian country above the Delta than does any other province in Northern Nigeria. The country is covered by dense forest; the native towns, as a rule, are buried in forest fastnesses; tsetse-flies abound and render the constant presence of horses and cattle—except the small semi-wild breed of Okpoto cattle—impossible; and the country is infested by chiggers.

At present the Bassa pagans are not practically approachable, from the sanitary point of view; until recently each village has been quite independent of the next one, and with which it has often been at war, while each village has been—and often still is—intensely jealous of its petty, parochial independence.

After leaving Bassa I proceeded to Baro, the headquarters and starting point of the railway. Baro is situated in a horseshoe or amphitheatre, scooped out of a table-land on the left bank of the Niger. Most of the Europeans live either on the table-land or, at least, uphill from the horseshoe.

During the rains tsetse-flies abound, tachinoides and palpalis in the horseshoe and up the cliff, and morsitans on the table-land behind. The fly nuisance has been greatly reduced since the completion, in 1909, of extensive clearing of trees and bush by Dr. Chartres.

Several cases of trypanosomiasis in natives have been discovered at Baro. It is impossible to say if all or any of these cases were or were not importations.

On November 25 I left Zungeru on a long tour of inspection, and the end of the year found me at Naraguta, less than half-way through that tour.

The first objective was Kateri, a Kadara village. Kateri had been reported to be the centre of an outbreak of sleeping sickness, and I went thither, accompanied by Dr. Simpson, Entomological Expert for West Africa, by Dr. Scott-Macfie, and by Dr. Porteous, who came in the dual capacity of local medical officer and as representative of the Resident, who could not come.

Kateri is situated in the midst of a dense kurumi, and the surrounding country is dotted all over with kurumis, nearly every one of which conceals a village.

A kurumi is the Hausa term for a piece of marshy ground, covered by dense forest and scrub. Drs. Simpson and Scott-Macfie found palpalis in every kurumi examined.

On arrival at Kateri all its inhabitants, eighty in number, were apparently well—all the sick having died before our arrival. The whole eighty people were examined, and blood films were taken from all; thirty-four showed enlargement of the cervical glands. In none of the cases was the cervical enlargement well marked; in fact, it was made out with difficulty in some of the cases, and in a few of them was confined to one side. Dr. Scott-Macfie discovered a trypanosome in the blood of one of the women, but careful examination failed to discover the parasite in any other case.

At several other villages in the district blood was taken from people who exhibited slightly enlarged cervical glands, but in all cases without any positive result. The blood films were all carefully re-examined at Zungeru, but again the parasite was only seen in one—to wit, that from the woman at Kateri.

The Kadaras wear very little clothing. This, combined with their inveterate love of living in kurumis and the wide distribution of *Glossina palpalis* in their country, renders them peculiarly vulnerable to the cause of sleeping sickness.

On December 7 I marched to Naraguta. The country in the neighbourhood of Naraguta is full of good sites. I selected what I considered the best, His Excellency approving the selection.

Steady efforts are being made to secure the universal principle of surrounding wells with parapets to prevent their contamination.

Mosquito-borne, fly-borne, and tick-borne diseases, water-borne diseases and leprosy need to have constant war waged against them. But in the Mohammedan part of Northern Nigeria—by far the most important area of the country—venereal diseases work more havoc than do all the diseases, mentioned above, put together.

Syphilis and gonorrhœa account for a larger number of the numerous cases of blindness, generally ascribed by the natives and non-medical Europeans to small-pox; syphilis causes an enormous amount of abortion, stillbirth, and infantile mortality; and it is no exaggeration to say that, outside of the pagan country, one half of the women of child-bearing age are barren on account of early gonorrhœa. This state of affairs tends to keep the population stationary, or even decreasing.

Steps have also been taken to initiate the establishment of segregation camps for lepers throughout the country.

By an Order under the Infectious Diseases Proclamation 1908 (section 4), the provisions of the Infectious Diseases Proclamation were applied to yellow fever.

During the year 254 Europeans and 1,392 natives were treated for malarial fever, of whom one European and 13 natives died. These figures refer to the number of cases treated, and do not necessarily mean 1,646 separate individuals.

In Lokoja, Baro, and Zungeru, puddles which cannot be effectively drained or filled up are regularly oiled; and the same principle is applied at bush stations when possible. Watercourses are kept clear, as far as the supply of labour available permits.

The Cantonment Magistrate at Lokoja arranged to let out the whole waste land within that cantonment, without rent, to cultivators, on the condition of cropping the entire surface of their holdings with short crops. If this scheme work, the cantonment will be kept thoroughly clear without extra expense.

Borrow-pits are either drained or filled up; no new borrow-pits are permitted to be made within the confines of stations; the wells in stations are

Return of Diseases and Deaths in 1910 in Northern Nigeria.

GENERAL DISEASES.

	Europeans		Natives		
	Admissions	Deaths	Admissions	Deaths	Total Cases Treated
Alcoholism	—	—	—	—	—
Anæmia	53	—	164	8	220
Anthrax	—	—	—	—	—
Beriberi	—	—	26	5	26
Bilharziosis	1	—	10	1	11
Blackwater Fever	9	2	1	1	10
Chicken pox	—	—	23	1	23
Cholera	—	—	—	—	—
Choleraic Diarrhœa	—	—	—	—	—
Congenital Malformation	—	—	—	—	—
Debility	10	—	89	2	99
Delirium Tremens	—	—	—	—	—
Dengue	—	—	—	—	—
Diabetes Mellitus	—	—	—	—	—
Diabetes Insipidus	—	—	—	—	—
Diphtheria	—	—	—	—	—
Dysentery	22	1	530	43	568
Enteric Fever	—	—	3	1	3
Erysipelas	—	—	—	—	—
Febricula	—	—	—	—	—
Filariasis	—	—	—	—	—
Gonorrhœa	—	—	1479	—	1517
Gout	2	—	—	—	2
Hydrophobia	—	—	—	—	—
Influenza	2	—	22	—	27
Kala-Azar	—	—	—	—	—
Leprosy	—	—	36	1	37
(*a*) Nodular	—	—	—	—	—
(*b*) Anæsthetic	—	—	—	—	—
(*c*) Mixed	—	—	—	—	—
Malarial Fever	250	1	1379	13	1646
(*a*) Intermittent	—	—	—	—	—
Quotidian	—	—	—	—	—
Tertian	—	—	—	—	—
Quartan	—	—	—	—	—
Irregular	—	—	—	—	—
Type undiagnosed	—	—	—	—	—
(*b*) Remittent	—	—	—	—	—
(*c*) Pernicious	—	—	—	—	—
(*d*) Malarial Cachexia	—	—	—	—	—
Malta Fever	—	—	—	—	—
Measles	—	—	56	—	56
Mumps	—	—	6	—	6
New Growths—	1	—	18	—	20
Non-malignant	—	—	—	—	—
Malignant	—	—	—	—	—
Old Age	—	—	—	—	—
Other Diseases	26	—	358	31	389
Pellagra	—	—	—	—	—
Plague	—	—	—	—	—
Pyæmia	2	2	4	1	6
Rachitis	—	—	—	—	—
Rheumatic Fever	—	—	—	—	—
Rheumatism	14	—	532	1	556
Rheumatoid Arthritis	—	—	—	—	—
Scarlet Fever	—	—	—	—	—
Scurvy	—	—	—	—	—
Septicæmia	—	—	5	2	5
Sleeping Sickness	—	—	7	1	7
Sloughing Phagedæna	—	—	1	—	1
Smallpox	—	—	34	3	43
Syphilis	3	—	491	2	583
(*a*) Primary	—	—	—	—	—
(*b*) Secondary	—	—	—	—	—
(*c*) Tertiary	—	—	—	—	—
(*d*) Congenital	—	—	—	—	—
Tetanus	—	—	1	1	1
Trypanosome Fever	—	—	—	—	—
Tubercle—	—	—	—	—	—
(*a*) Phthisis Pulmonalis	—	—	—	—	—
(*b*) Tuberculosis of Glands	—	—	—	—	—
(*c*) Lupus	—	—	—	—	—

	Europeans		Natives		
	Admissions	Deaths	Admissions	Deaths	Total Cases Treated
General Diseases—*continued.*					
(*d*) Tabes Mesenterica	—	—	—	—	—
(*e*) Tuberculous Disease of Bones	—	—	—	—	—
Other Tubercular Diseases	1	—	8	3	10
Varicella	—	—	—	—	—
Whooping Cough	—	—	2	—	2
Yaws	—	—	90	—	91
Yellow Fever	—	—	—	—	—

LOCAL DISEASES.

Diseases of the—					
Cellular Tissue	21	—	604	—	657
Circulatory System—	—	—	—	—	—
(*a*) Valvular Disease of Heart	—	—	28	9	28
(*b*) Other Diseases	7	1	30	4	37
Digestive System—	—	—	—	—	—
(*a*) Diarrhœa	36	—	893	13	931
(*b*) Hill Diarrhœa	—	—	—	—	—
(*c*) Hepatitis	4	—	9	2	13
Congestion of Liver	8	—	6	6	15
(*d*) Abscess of Liver	—	—	—	—	—
(*e*) Tropical Liver	—	—	—	—	—
(*f*) Jaundice, Catarrhal	2	—	6	—	9
(*g*) Cirrhosis of Liver	—	—	—	—	—
(*h*) Acute Yellow Atrophy	—	—	—	—	—
(*i*) Sprue	—	—	—	—	—
(*j*) Other Diseases	207	—	2657	9	2875
Ear	16	—	142	—	158
Eye	8	—	738	—	754
Generative System	20	—	321	6	347
Male Organs	—	—	—	—	—
Female Organs	—	—	—	—	—
Lymphatic System	16	—	212	—	232
Mental Diseases	24	—	265	2	292
Nervous System	4	1	15	2	21
Nose	9	—	39	—	48
Organs of Locomotion	22	—	1128	—	1138
Respiratory System	44	—	1191	13	1264
Skin—	—	—	—	—	—
(*a*) Scabies	—	—	10	—	10
(*b*) Ringworm	7	—	48	—	57
(*c*) Tinea imbricata	—	—	—	—	—
(*d*) Favus	—	—	—	—	—
(*e*) Eczema	4	—	48	—	52
(*f*) Other Diseases	77	—	1965	3	2154
Urinary System	—	—	—	—	—
Injuries, General, Local—	64	1	5242	17	5397
(*a*) Siriasis (Heatstroke)	4	—	1	1	5
(*b*) Sunstroke (Heat Prostration)	9	—	4	1	13
(*c*) Other Injuries	—	—	—	—	—
Parasites—	9	—	983	1	1011
Ascaris lumbricoides	—	—	—	—	—
Oxyuris vermicularis	—	—	—	—	—
Dochmius duodenalis, or Ankylostoma duodenale	—	—	—	—	—
Filaria medinensis (Guinea-worm)	—	—	760	—	774
Tapeworm	—	—	—	—	—
Poisons—	—	—	—	—	—
Snake-bites	—	—	21	—	21
Corrosive Acids	—	—	—	—	—
Metallic Poisons	2	—	1	—	3
Vegetable Alkaloids	—	—	—	—	—
Nature Unknown	—	—	—	—	—
Other Poisons	4	1	51	1	55
Surgical Operations—	—	—	—	—	—
Amputations, Major	—	—	—	—	—
,, Minor	—	—	—	—	—
Other Operations	—	—	—	—	—
Eye	—	—	—	—	—
(*a*) Cataract	—	—	—	—	—
(*b*) Iridectomy	—	—	—	—	—
(*c*) Other Eye Operations	—	—	—	—	—

kept covered when this is possible, but up country it is often impossible to secure efficient covers; in such cases the well is usually further distant than a mosquito's flight from any European residence.

During the last three years more attention has been paid to the wells than was ever done before, and their condition is being steadily improved.

The use of the mosquito net is universal among the European community, while quite a considerable proportion of native servants, soldiers, police, and other native employees, together with a good many African non-natives, also habitually use it.

During the year eight cases of trypanosomiasis were noted and seven were treated. One of the cases ended fatally. One of the people affected went to his own country on the coast; one, at Kateri, was left in her own village; the remainder were sent to the neighbourhood of Zaria.

In July a circular was sent all over the country from the Secretariat, warning Europeans of the danger of wearing "shorts" on account of the large amount of skin exposed thereby to biting flies.

Small-pox is endemic, but takes the epidemic form somewhere every year. Forty-three cases, all of them in natives, were treated, and three were fatal. 3,942 successful vaccinations were performed during the year.

Small-pox is essentially a dry-weather disease, every outbreak going down with the onset of the rains.

Dysentery is endemic and is observed all through the year; but is generally most common, taking the country as a whole, when the rains begin to flush the dry watercourses.

Leprosy is found everywhere and the number affected is very large, particularly in the north.

Steps are being taken, as already mentioned, to establish segregation camps, and the medical and political officers all over the country are collecting statistics of lepers.

Yaws is observed from time to time, and sometimes it appears to assume an epidemic form; further observations will have to be accumulated before this can be stated as a matter of fact.

Tuberculosis is an exceedingly rare disease among the natives; but it is not at all uncommon among African non-natives from the coast.

Pneumonia often appears to assume epidemic form, when, during the cold weather, the natives huddle together in ill-ventilated huts for mutual warmth.

Rheumatism is a very common disease, and cardiac complications, very often aortic, are frequently observed.

Intestinal worms are very common everywhere, and the average native, of whatever race, takes them pretty much as a matter of course, regarding them with the same indifference as the European does a common cold.

Bilharzia is fairly common, especially in the provinces of Yola and Bornu.

Guinea-worm is common everywhere. The reason for this is that it is much more prevalent among those who travel than among those who are always sitting down in one place, and most of the people, particularly the Hausas, are born traders.

Where medical officers are stationed slaughtering grounds and meat markets are regularly inspected, and in this way Europeans and some of the natives are protected.

No water system for the disposal of sewage exists. Earth closets and latrine trenches are the methods used for the disposal of excreta at all stations. The system of direct trench latrines is gradually being abolished, in favour of the universal use of earth closets, at all stations where the local resources are sufficient for the purpose. In most native towns every compound has one or more tumburis. Tumburis are piriform pits, from 4 ft. to 18 ft. deep, with the end at the top. They are a kind of septic pit, not rendered in brick and cement and surrounded with puddled clay. They are practically never cleared out. The danger in connection with them is the pollution of wells.

Disposal of Refuse.—At Lokoja part of the combustible refuse is disposed of by burning, and the remainder is thrown into the Niger. At Baro, Zungeru, and all other stations in the country combustible rubbish is burnt daily, and the non-combustible rubbish is buried. In Zungeru station, as distinguished from the native town, a sufficient number of incinerators, at suitable spots, were erected during the year to dispose of all the combustible rubbish. They have proved a great success. The natives themselves, in their own towns, are gradually in increasing numbers adopting our method of burning and burying their refuse.

The water supply of Lokoja is derived from the Niger and from wells; of Baro, from a reservoir at the back of the amphitheatre, where the water oozing from the face of the plateau is intercepted; and at Zungeru, from the Dago, which flows through the cantonment. At the stations in the country the water supply is derived from streams or from water-holes in the dry beds of streams or from wells or from springs, and at a considerable number of stations the normal supply is supplemented by roof-water collected in iron tanks. At most stations the drinking water for Europeans is condensed, and a sufficient supply is issued to each European daily. In many parts of the country, particularly during the dry season, the water is of very inferior quality.

Drainage.—The soil over most parts of the country is light and porous and percolation is free and rapid. Surface drainage is effected by natural watercourses and by artificial trenches. There are very few stations which do not stand sufficiently high to permit the escape of their surface water.

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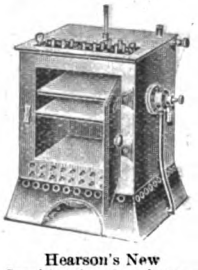

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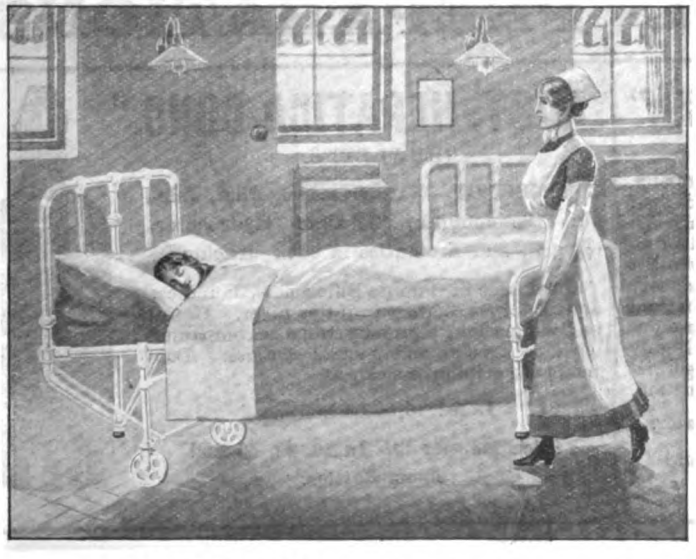

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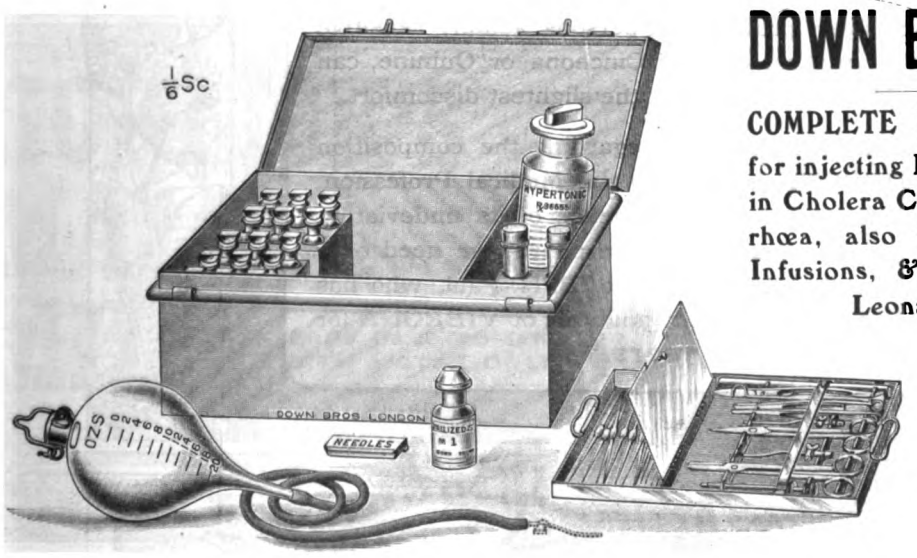

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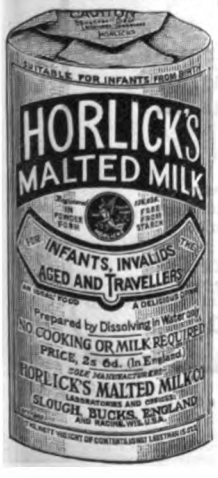
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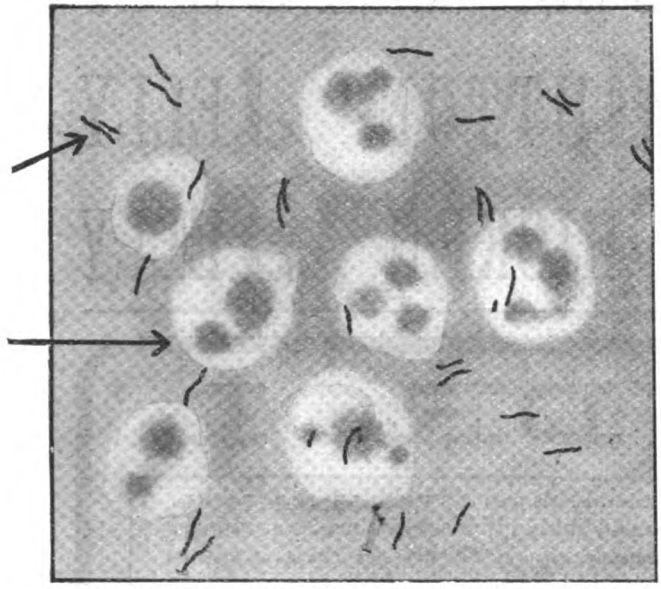

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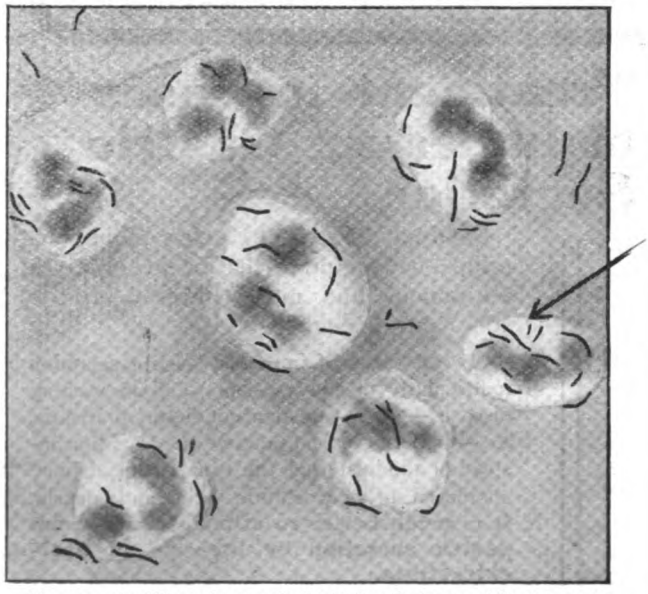

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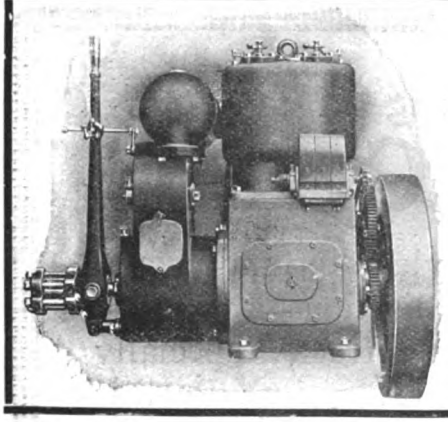

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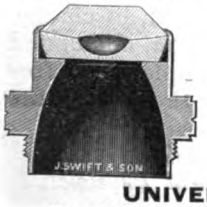

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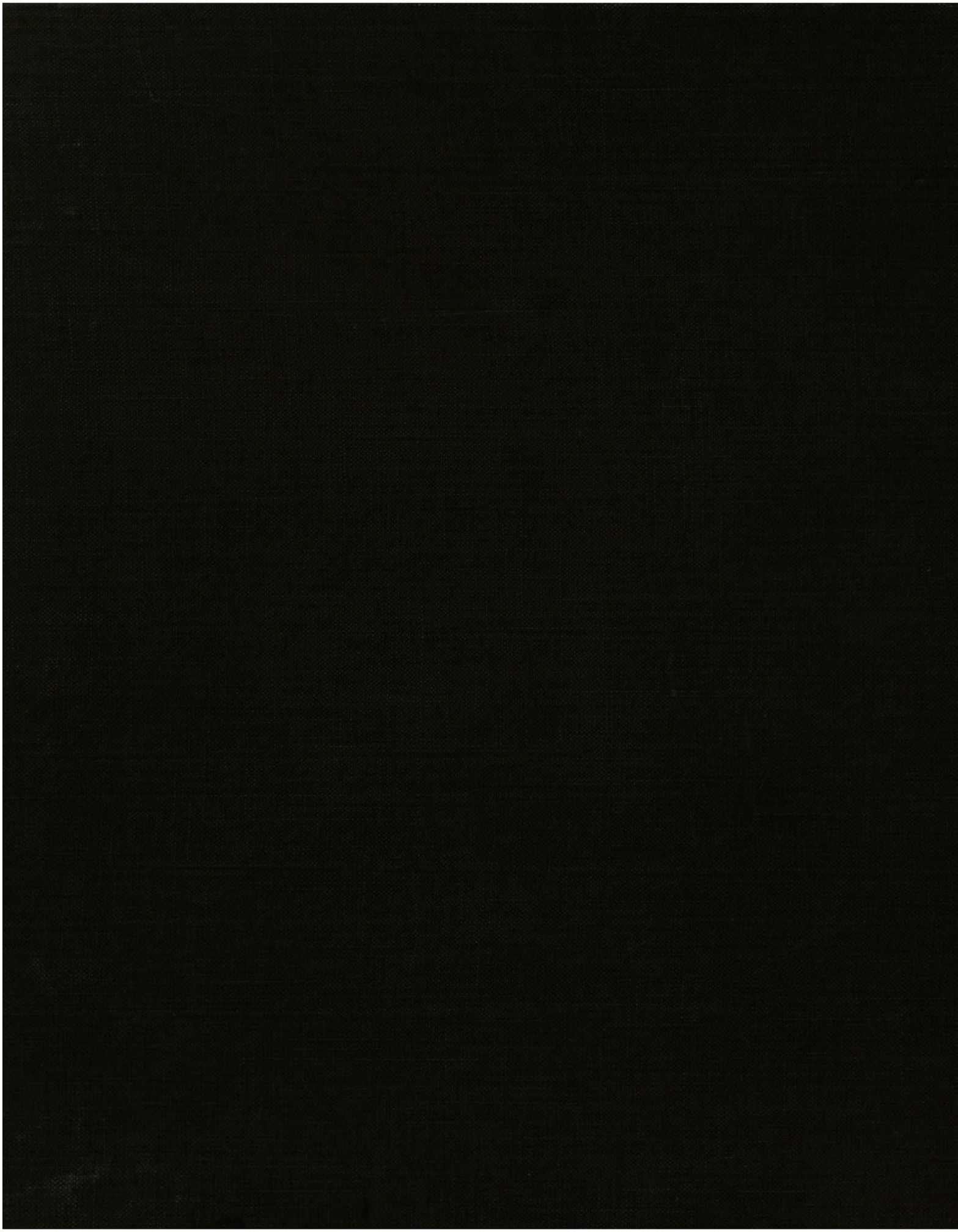
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